

समाचार पत्रिका

नेपाल भौगर्भिक समाज

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OF
NEPAL GEOLOGICAL SOCIETY

NEPAL GEOLOGICAL SOCIETY
(Est. 1980)

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NGS NEWS

The 20th Annual General Body Meeting of Nepal Geological Society (NGS) was held on 31 August 1999 (15 Bhadra 2056) in the auditorium of Department of Mines and Geology Lainchaur, Kathmandu. The meeting was conducted under the chairmanship of Mr R. K. Aryal, President, Nepal Geological Society. The meeting was attended by most of the members of the society residing in Kathmandu and outside.

The meeting commenced with the welcome speech of Mr R. K. Aryal, President, NGS. It was followed by the presentation of annual report by Mr U. B. Shrestha, General Secretary, and annual financial report of the society for the fiscal year 2055/056 by Mr Arjun Aryal, Treasurer. Mr Shrestha's speech was focused on the activities carried out by the Society in the last one year period and about the future programmes of NGS. Mr Arjun Aryal presented the financial status of 2055/056. On this occasion, Dr. B. N. Upreti, Convener, International Symposium gave a brief account on the progress of the Symposium. It was followed by discussions on various topics. There was an active participation of the members during the discussions on various issues. Some important decisions were made in the meeting after the discussions.

Nepal Geological Society in collaboration with IDNDR National Committee, Nepal, HMG/Ministry of Home UNDP-Nepal, Disaster Mitigation Support Programme Project (DMSP), National Society for Earthquake Technology, Nepal and Lutheran World Federation/ Nepal organised a one-day National Meeting cum Seminar on **Prevention Pays Off** to commemorate the **International Decade for Natural Disaster Reduction (IDNDR) Day 1999** declared by UN. The meeting was held in the auditorium of Russian Cultural Centre, Kamalpokhari, Kathmandu on 13 October 1999. It was attended by more than 250 participants from various

organisations and institutions. The inaugural session was chaired by Mr P. P. Pokharel, Secretary, Ministry of Home. Honorable Home Minister, Mr P. B. Khandka sent his message to the meeting and read by Mr A. M. Dixit. Mr P. B. Malla, Honourable member of NGS inaugurated the Seminar.

The national meeting was followed by a Technical Seminar on **Natural Disaster Prevention in Nepal**. In this seminar eight technical papers were presented by the professionals of various disciplines in two technical sessions.

Nepal Geological Society (NGS), under the sponsorship of the International Association for Engineering Geology and Environment (IAEG) and endorsed by the International Decade for Natural Disaster Reduction (IDNDR) Secretariat, Geneva Switzerland, COGEOENVIRONMENT (IUGS) and also in association with various national and international organisations, has successfully organised an **International Symposium on Engineering Geology, Hydrogeology and Natural Disaster with emphasis on Asia** in Kathmandu, on 28 to 30 September 1999. The Symposium was graciously inaugurated by **His Majesty King Birendra Bir Bikram Shah Dev. Her Majesty Queen Aishwarya Rajya Laxmi Devi Shah** also graced the occasion. It was attended by over 419 geoscientists/ delegates and guests from 34 countries of Europe, America, Australia, Africa and Asia. Altogether 185 research papers were presented in this 3 day-long Symposium. Publication of Proceedings of the Symposium is in progress.

In this year of 1999/2000, the Nepal Geological Society has organised one **geoscientific talk programme on** 'The origin of Himalaya in anatexis and inverted metamorphism: Model and constraints' by Dr. T. M. Harrison, a distinguished geo-scientist and Professor of the

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A Memorandum of Understanding for a professional exchange between the Nepal Geological Society (NGS) and the Geological Society of Thailand (GST) was signed in Bangkok, Thailand, on 28 January 2000. The areas of future cooperation include: (a) to make regular exchange of information and publications of the respective societies, (b) to accord priority in terms of support (partially or fully) of the participation of members of the respective Societies in international seminars, conferences, and exchange of visits of respective members in the programmes organised by NGS/ GST; (c) to provide respective or ganisational memberships after appropriate consideration within the relevant bodies, and (d) to accord maximum possible cooperation in carrying out geo-scientific research in their respective countries.

The representation of the Nepal Geological Society is being made, as in the past, in various meetings, workshops, and seminars organised by various governmental and non-governmental organisations.

Dr B. N. Upreti, Former President of Nepal Geological Society, participated in the **15th Himalaya-Karakoram-Tibet (HKT) International Workshop held in Chengdu, People's Republic of China**, from 15 to 22 April 2000. On behalf of NGS he proposed to hold for the second time, the HKT International Workshop in Kathmandu on the occasion of 25th Anniversary of Nepal Geological Society in the year of 2005.

On the occasion of 55th Birth day His Majesty King Birendra Bir Bikram Shah Dev has decorated two of NGS members, Mr R. K. Aryal, President, and Mr K. P. Kaphle, Former President of NGS, with **Prabal Gorkha Dakshin Bahu Medal** for their devotion and efforts in making the International Seminar a success.

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20th GENERAL BODY MEETING OF NEPAL GEOLOGICAL SOCIETY

नेपाल भौगर्भिक समाजको बीसौं वार्षिक साधारण सभा

१५ भाद्र २०५६ (३१ अगस्त १९९९) काठमाडौं, नेपाल

नेपाल भौगर्भिक समाजको बीसौं साधारण सभा गत भाद्र १५ गते २०५६ (तदनुसार ३१ अगस्त १९९९) का दिन समाजका अध्यक्ष श्री रमेश कुमार अर्यालको अध्यक्षतामा काठमाण्डौं, लैनचौर स्थित खानी तथा भूगर्भ विभागको अडिटोरियममा सुसम्पन्न भएको थियो । उक्त अवसरमा सर्वप्रथम समाजका अध्यक्ष श्री रमेश कुमार अर्यालले आफ्नो स्वागत भाषण प्रस्तुत गर्नुभएको थियो । सो अवसरमा उहाँले नेपाल भौगर्भिक समाजले गत एक वर्षमा गरेका मुख्य मुख्य कामहरू र अब आउदा दिनहरूमा गरिने कार्यक्रमहरू बारे संक्षिप्त प्रकाश पार्नुका साथै आउदो International Symposium को समुद्घाटन श्री ५ महाराजधिराज सरकारको बाहुलिबाट गराउन प्रयास भइरहेको जानकारी गराउनु भयो ।

तत्पश्चात् यस समाजका महासचिव श्री उत्तमबोल श्रेष्ठले समाजको वार्षिक प्रतिवेदन प्रस्तुत गर्नुभयो । उक्त अवसरमा विगतमा नेपाल भौगर्भिक समाजले गरेका तथा भविष्यमा संचालन गरिने कार्यक्रमहरूको विवरण दिनुका साथै आउदो 19th October 1999 मा IDNDR-Day र Sept.28-30, 1999 मा आयोजना गरिने International Symposium on Engineering Geology, Hydrogeology and Natural Disaster लाई सफल पार्न सम्पूर्ण साथीहरूसँग सहयोग मागनुका साथै सन् २००० मा 3rd Geological Congress आयोजना गर्ने बारे राय मागनु भयो । उक्त अवसरमा उहाँले हालसम्म नेपाल भौगर्भिक समाजको सदस्य सङ्ख्या ४४० र एसोसिएट सदस्य सङ्ख्या २० गरि जम्मा ४६० भएको कुरा जानकारी गराउनु भयो ।

यस पछि कार्यक्रमलाई अगाडी बढाउने क्रममा उक्त समाजका कोषाध्यक्ष श्री अर्जुन अर्यालले समाजको गत आ. व. को. आय व्यय विवरण प्रस्तुत गर्नुका साथै लेखा परिक्षणको विवरण समेत प्रस्तुत गर्नु भयो । तत्पश्चात् International Symposium का संयोजक डा. विशालनाथ उप्रेतीले उक्त Symposium बारेको प्रगति समिक्षा प्रस्तुत गर्दै हाल सम्म २३२ Research Paper हरूको Abstract प्राप्त भैसकेको र सो Symposium मा सबै महादेशबाट Participants हुने कुरा अवगत गराउनु भयो ।

तत्पश्चात् छलफलको कार्यक्रम शुरु भएको थियो । उक्त छलफलमा उठेका विभिन्न विषयमा सदस्यहरूको सक्रिय सहभागिता रहेको थियो । उक्त अवसरमा हरेक बुढामा भएका छलफल पछि केही निर्णयहरू पनि गरिएका थिए । सो सभामा प्रस्तुत गरिएका प्रतिवेदन एवं भाषण र विभिन्न समसामयिक विषयमा उठेका प्रश्न एवं त्यसमा भएका छलफलहरू र जवाफहरू तल प्रस्तुत गरिएको छ ।

नेपाल भौगर्भिक समाजका अध्यक्ष श्री रमेशकुमार अर्यालको स्वागत भाषण (Welcome Speech By Mr R.K.Aryal, President, Nepal Geological Society)

सम्मानित सदस्यज्यूहरू,
भूतपूर्व सभापतिज्यूहरू,
समाजका आदरणीय सदस्य तथा मान्यजनहरू,

सर्वप्रथम म यस नेपाल भौगर्भिक समाजले आयोजना गरेको आजको २० औं साधारण सभामा उपस्थित सबै आदरणीय समाजका सदस्यहरूलाई नेपाल भौगर्भिक समाज तथा म आफ्नो तर्फबाट हार्दिक स्वागत गर्दछु ।

आदरणीय सदस्यहरू, समाजले आफ्नो ३ बर्ष कार्यकालको प्रथम एक वर्ष अवधि पुरा गरिसकेको छ र यस एक वर्ष अवधिमा हामीले आनो कार्यकालमा सम्पन्न गरेको कार्यहरू तथा निकट भविष्यमा सम्पन्न गर्नुपर्ने International Conference/ Symposium on Engineering Geology, Hydrogeology and Natural Disasters with Emphasis on

Asia from 28 to 30 September 1999. र 19 October 1999 का दिन अन्तिम IDNDR-DAY मनाउने बारे पनि आदरणीय सदस्यहरूलाई अवगत गराउनेछौं ।

आदरणीय सदस्यज्यूहरू हालको व्यवस्था अनुसार आउदो International Symposium को उद्घाटनको लागि श्री ५ महाराजधिराज सरकारमा बिन्ती जाहेर गरिसकेकाछौं र यस समबन्धमा हामीले आजका दिनसम्म सकारात्मक जवाफ पाएकाछौं ।

विगतमा जस्तै यो कार्यकारिणी समितिले समाजका आदरणीय सदस्यज्यूहरूबाट समाजको उन्नति तथा प्रगतिको लागि महत्वपूर्ण सुझाव, सरसल्लाहको अपेक्षा राख्दछु ।

अब म आनो मन्तव्य पूरा गर्दै अन्य विषय प्रवेशको लागि अरु साथीहरूलाई आमन्त्रित गर्दछु ।

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Research and Development

Annual Report by Mr U. B. Shrestha, Secretary General, NGS

Mr Chairman,
Respected Members of the Society,

It gives me a great pleasure to welcome you all to the 20th Annual General Body Meeting of the Nepal Geological Society, on behalf of the 10th Executive Committee and myself. We have already passed a year since we took the responsibility of prestigious office of the Nepal Geological Society.

During the period we have put our efforts to the extent possible to enhance the activities of the Society and fulfil its objectives. In this context, dear Respected Members, firstly I would like to inform you about the major works completed during the year and then to inform about the activities to be undertaken in the coming year.

The various works completed during one year tenure are:

Observing the IDNDR Day

The Nepal Geological Society in close co-operation with HMG/ Ministry of Home, IDNDR National Committee Nepal, Water Induced Disaster Prevention Technical Centre (DPTC), UNDP-Nepal, Lutheran World Federation - Nepal, National Society for Earthquake Technology Nepal (NSET-Nepal) had organised a one day National Meeting cum Seminar on Natural Disaster Prevention and the Media: Prevention begins with Information to commemorate the UN declared International Decade for Natural Disaster Reduction (IDNDR) Day 1998, at the Russian Culture Centre on 14th October 1998. It was attended by more than 250 participants from various institutions and organisations. On this occasion various distinguished personalities highlighted the importance of media in natural disaster management. Nine technical papers and a drama were also presented.

To celebrate this occasion, a three day training programme on Disaster Journalism to the media people and the awareness-raising poster publication on Natural Disaster Prevention for wider distribution was also carried out.

Award:

1998 - UN Merituous Certificate for the Disaster Prevention: The Nepal Geological Society was awarded by the jury of 1998 - UN

Sasakawa Disaster Prevention Award with the 1998 Merituous Certificate for the Disaster Prevention. The Society was awarded for its efforts in disseminating the scientific knowledge and spreading the awareness of prevention of natural disasters. The award was announced by UN Humanitarian and Emergency Relief Co-ordination Office of IDNDR Secretariat in Geneva, Switzerland.

Publication:

The News Bulletin of Society (V ol. 16) as well as the Proceedings of the Second Nepal Geological Congress, Special Issues of the Journal of Nepal Geological Society (V ol. 18) were published. We have already started distribution of this Journal to our subscribers, members, and other institutions. We request all our members to purchase the journal and help towards making the publication sustainable. The News Bulletin of the Society is distributed for free of cost to our respected members. Vol. 19 and 20 of the journal are in the final stage of editing and will soon be sent for publication.

Talk Programme and Film Show:

Scientific talk programmes were organised with the close co-operation of Scientific Subcommittee. The programmes conducted are "The evolution of the Himalayan Orogeny" by Dr. G. Fuchs, "Why Study the Pollen Grains?" by Dr. D. K. Fergusson, "Environmental Change and Mammalian Evolution in east Asia During the Late Tertiary and Quaternary" by Professor Nina G. Jablonski, and "Seismo-tectonics of Central Himalayas: Current Knowledge" by Dr. J. P. Avouac. A documentary film on Himalayan Geology entitled "The roof of The world" prepared by BBC was also shown. All these programmes were conducted in the auditorium hall of the Department of Mines and Geology.

A Memorandum of Understanding:

A Memorandum of Understanding for professional exchange was signed between Highline Community College des Moines, Washington, USA, and the Nepal Geological Society on 27 Feb. 1999. The details of the Memorandum of Understanding were highlighted by Dr. Dibya Ratna Kansakar in the auditorium Hall of the Department of Mines and Geology on 9th Phalgun, 2055.

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and
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to
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Respected Members of the Society,

The Society had gained a considerable strength in its membership. At present, the Society have 440 members and 20 associate members.

Dear respected members, now I am pleased to inform about the major activities of the Society to be undertaken very soon:

International Symposium On Engineering Geology, Hydrogeology, and Natural Disasters with Emphasis on Asia, Sept. 28-30, 1999

Dear respected members, I feel proud to inform you that this symposium is going to be held on 28-30 Sept. 1999. The organisers have received overwhelming responses from the members of the Society, professionals as well as concerned organisations/institutions throughout the world. Keeping this in mind, we are organising this symposium in the Birendra International Convention Centre. We have approached **His Majesty the King** for the inauguration. Till now we have received positive response from His Majesty's Secretariate. We hope that His Majesty will grace the inauguration ceremony.

The first and second circulars of the symposium were widely distributed to the members of various societies, professionals, concerned organisations, and institutions throughout the world. As a consequence of the wide circulation, we have received 434 registrations. Among which, till now, we have 100 confirmed participants from the SAARC region (out of them, there are 55 from Nepal). There are 180 participants from Europe, America, Japan, and other countries. We will be covering all the presentations by running three parallel sessions in auditoriums of Birendra International Conventional Hall.

In this context, soon we will distribute the third circular to concerned professionals, related organisations, and institutions.

Excursions:

In connection with the International Symposium, we are arranging the following two field excursions for our participants:

- (1) **Kathmandu-Butwal-Tansen-Pokhara-Kathmandu:** A four day excursion. Till now we have 80 confirmations from the participants for the excursion.
- (2) **Kathmandu-Kodari-Kathmandu:** One day excursion. Till now we have nearly 30 participants for this excursion.

Financial Aspect of the Symposium:

We had estimated the whole activities of the Symposium by considering 350 confirmed participants. The expected expenditure of Rs. 2,832,103.00 and expected income of Rs. 2,471,000 leads to a deficit of Rs. 361,103.00. We expect to raise this amount by the income from registration of the additional Nepalese participants and also from the contribution of local consulting and construction companies working in Nepal.

Dear respected members, I think any activities of the society could be considered successful only if it is participated by a maximum number of members of the Society. Keeping this in mind and the cost of the symposium, we have fixed a very liberal registration cost of Rs. 1000.00 only for the Nepalese members of the Society who will be joining the Symposium individually. Any members of the Society wishing to register for the symposium could register in the NGS office. For those members who are busy at present, could also register on 27 September 1999 in Birendra International Conventional Hall.

IDNDR- Day, 1999:

The coming IDNDR-Day 1999, the last event of the decade, will be held on 13 October 1999 on the theme **Prevention Pays**. As usual, this IDNDR Day will be observed in close association with HMG/ Ministry of Home, IDNDR National Committee, Nepal DPTC-Nepal, UNDP-Nepal, Lutheran World Federation - Nepal, National Society for Earthquake Technology (NSET-Nepal) by running a day-long National Meeting cum Seminar. There will also be two additional programmes: 1) publication of natural disaster awareness-raising posters and 2) workshop to the members of the Parliament. We have got financial assurance for some of the programmes from UNDP-Nepal.

Third Nepal Geological Congress:

Dear Respected Members, during the 19th Biennial General Body Meeting, we had promised that the Third Nepal Geological Congress will be organised in 2000 A. D. As all of you are aware that present executive body is quite busy with the present International Symposium, we will not be left with sufficient time for the organisation of the Third Nepal Geological Congress in 2000 A. D. Moreover, there will be a great difficulty in generating

financial support within such a short period. Hence, I propose that the Third Nepal Geological Congress be organised in 2001 A. D. May I recall, **dear respected members**, that traditionally we observe the congress every two years.

Dear members, whatever we are able to do during the year are due to your help, support, and advice. On behalf of the Executive Committee and myself, I would like to offer our sincere thanks all of you for your active cooperation and continued support all the time. Various governmental and non-governmental organisations / Agencies, have provided technical and financial support to the Society. The 10th Executive Committee would like to thank those organisations and agencies and hope that such cooperation will be continued in the future. Particularly, I would like to mention here the following organisations:

- Department of Mines and Geology;
- Petroleum Exploration Promotion Project;
- Ground water Resources Development Project;
- Department of Irrigation;
- Central Department of Geology, Kirtipur Campus, Tribhuvan University;
- Department of Geology, Tri-Chandra Campus, Tribhuvan University;

- DPTC, UNDP;
- Lutheran World Service;
- BGR/DMG;
- Nepal Electricity Authority;
- Nepal Electricity Development Centre;
- Ministry of Home;
- ICIMOD;
- Ministry of Science and Technology;
- Nepal Engineers Association;
- UNESCO Regional Office, Delhi;
- IAEG;
- NSET;

While working, there may have been shortcomings and weaknesses from our part. For this, I would like to take this opportunity to extend our sincere apology on behalf of the executive committee. Also at this moment, we would like to renew our request once again for the continuation of your support, advice, and cooperation as well as to point out our weaknesses. We sincerely hope that we will be guided by the respected members of the society in future.

Thank you all.



With Best Compliments from



इस्ट कन्सल्ट

EastConsult

A National Consulting Organisation, committed to high standard of performance & technical excellence.

P.O. Box 1192, Lazimpat, Kathmandu
 Tel.: 413267, 412062, 428496
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Areas:

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- Waste Disposal & Management
- Urban Infrastructure
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- Irrigation, Agriculture & Forestry
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- Hydropower Development
- Computer Application & Information Technology

Subsidiaries:

- ESLA : East Soil Lab
- EDCO : East Drilling Company
- ESCO : East Surveying Company

Services:

- Survey, Investigation & Design Works
- Construction Supervision & Management
- Computer-Aided Designs (CAD)
- Socio-Economic Studies
- Project Preparation
- PES/IEE & EIA (Environmental Studies)
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EASTAP: East Action Programmes

Engineers

Social Scientists

Economists

Development Planners

कोषाध्यक्ष श्री अर्जुन अर्यालले प्रस्तुत गर्नुभएको २०५५/०५६ को आर्थिक विवरण

श्रद्धेय सभाका सभापतिज्यू,
सम्मानित सदस्यज्यूहरू,
नेपाल भौगर्भिक समाजका पूर्व अध्यक्षज्यूहरू,
वर्तमान कार्यकारिणी समितिका साथीहरू
एवं सम्पूर्ण सदस्यज्यूहरू ।

सर्वप्रथम मलाई यस प्रतिष्ठित समाजको उन्नाइसौं साधारण सभाले आर्थिक गतिविधि हेर्ने महत्वपूर्ण जिम्मेवारी सुम्पिएकोमा यस समाजका सम्पूर्ण सदस्यज्यूहरूलाई पुनः हार्दिक धन्यवाद दिन चाहन्छु ।

आदरणीय साथीहरू,

आज म यस दशौं कार्यकारिणी समितिले गत एक वर्षको कार्यकालमा गरेको आर्थिक विवरणलाई अधिकार प्राप्त लेखा परीक्षकबाट परीक्षण समेत गराई तपाईंहरू सामु पेश गर्न गइरहेको छु । यसका मुख्य शीर्षकहरूमा भएको Income & Expenditure तथा Receipt & Payment सम्बन्धी संक्षिप्त भलक तपाईंहरू समक्ष पेश गरिनै सकेको छु ।

साथीहरू,

यस समाजले आगामी सेप्टेम्बर २८-३० मा International Symposium गर्न गइरहेको कुरा यहाहरूलाई अवगत भएकै विषय हो । यसैकारण हाम्रो सम्पूर्ण आर्थिक गतिविधि पनि त्यसैसँग बढि केन्द्रित हुनगएको तथ्य यहाहरू समक्ष अवगत गराउदछु । आर्थिक दृष्टिकोणले हेर्दा यो वर्ष समाजका लागि अति प्रवेगशील तथा उपलब्धिपूर्ण वर्षको रूपमा लिनसकिन्छ । तर यस वर्ष भएको केही आम्दानी आगामी Symposium मा खर्च हुनसक्ने कुरा जानकारी गराउदछु ।

अब म यस सम्बन्धी मोटामोटी विवरण उल्लेख गर्ने अनुमति चाहन्छु ।

२०५५ श्रावण मसान्त (गत आर्थिक वर्षको अन्त्य) सम्मको हिसाबः

बैंक मौज्दात	रु. ९,१७,९५९.६७
नगद	रु. २१,०३१.००
जम्मा	रु. ९,३८,९९०.६७

यस आर्थिक वर्ष (२०५५/५६) मा भएको आम्दानी र खर्चः

आम्दानी	रु. १८,५३,८९३.६७
खर्च	रु. ७,१७,०७३.९९
बचत	रु. ११,३६,८१९.६८

उपरोक्त खर्चमा गत साधारण सभाको लागि Hotel Malla मा भएको Dinner खर्च, Second Nepal Geological Congress को Proceeding Printing खर्च, जुन अधिल्लो

आर्थिक वर्षको आम्दानीबाट नै खर्च हुनुपर्ने देखिन्छ, समेत समावेश छन् ।

यस आर्थिक वर्षमा भएका प्रमुख आम्दानीहरू यसप्रकार छन् ।

International Symposium को लागि Contribution:

• IAEG	US\$ 3,400.00
• BGR Project	US\$ 2,000.00
• ICIMOD	US\$ 2,000.00
• UNESCO	US\$ 500.00
• Dr. Hirayama, Japan	Rs. 11,200.00
• Natraj Travel	Rs. 10,000.00
• East Consult	Rs. 10,000.00

International Symposium का अन्य प्रमुख आम्दानीहरूः

• Registration	Rs. 178,200.00
• Registration	US\$ 4,425.00
• Post Symposium Excursion	US\$ 5,400.00
• Advertisement (Pagini)	US\$ 477.00

साथै सोही Pagini Company ले International Symposium मा वितरण गर्न ३२० वटा Computer CD उपलब्ध गराएको छ ।

IDNDR को लागि Contribution:

• DPTC	Rs. 35,000.00
• Lutheran World	Rs. 20,000.00
• Ministry of Home	Rs. 10,000.00

Contribution for Journal Printing:

• Godavari Marble (P) Ltd.	Rs. 15,000.00
• Dr. Klaus Busch, (Germany)	Rs. 8,000.00

यस वर्षको अन्य आम्दानी तथा खर्चहरूको विवरण यहाहरूलाई प्राप्त भइसकेको छ । उक्त खर्चमध्ये समाजको सम्पत्तीको रूपमा रहने गरी एक Laser Printer 6L र एक Steel Cabinet तथा अन्य सामानहरू समेत किनिएका छन् ।

संक्षिप्तमा हेर्दा समाजसँग हाल जम्मा रु. २०,९७,५५९.७१ नगद सम्पत्ती रहेको र सोमध्ये रु. ११,५८,५६९.०४ यस आर्थिक वर्षको आम्दानी बाट भएको कुरा जानकारी गराउदछु र म यो विवरण सदस्यज्यूहरू समक्ष प्रतिक्रियार्थ पेश गर्दछु ।

धन्यवाद ।

Best Wishes
To
NEPAL GEOLOGICAL SOCIETY
FROM
BUTWAL POWER COMPANY LIMITED (BPC)

Field of Activities:	Build, own and operate hydropower plants by maximising use of local capability and institution building
Accomplishments:	Tinau - 1 MW, Andhikhola - 5.1MW, Jhimruk - 12MW
On-going Activities: <i>Project Development</i>	Khimti Hydropower Project (60 MW) through involvement as sponsor and party to engineering design, project management, training and technology transfer and other support services
	Environment and community development services and various other consulting services i.e. feasibility studies, model studies, geotechnical studies etc. through its Hydroconsult Department
<i>Operation & Management</i>	Andhikhola and Jhimruk Power Plants
<i>Rural Electrification</i>	Syangja, Palpa and Pyuthan districts

Address: Pulchowk, Lalitpur, P.O. Box: 11728, Tel: 538419/535595/538404 Fax: 527901

Auditor's Financial Report of Fiscal Year 2055/056

The Members
Nepal Geological Society
Kathmandu.

Gentlemen,

I have audited the attached Receipt and Payment Account for the year ended on 32nd Shrawan, 2056, and reports as follows:

1. I have got all the information and explanations which are required for the purpose of audit.
2. Proper books as required are maintained according to Company's Law.
3. The attached Receipt and Payment Account and Income and Expenditure Account are drawn properly up in accordance with records which are made available to me.
4. According to the information given to me the attached Income & Expenditure Accounts prepared for the year ended 32nd Shrawan 2056 exhibit true and fair view.

Sd.

(Babu Raja Bajracharya)

Registered Auditor

Date: 10th Bhadra 2056

With the Best Wishes

from

GANESH HIMAL ZINC-LEAD PROJECT



NEPAL METAL COMPANY LIMITED

Gyantole, Gyaneshwor

Post Box 468, Kathmandu, Nepal

Phone: 412 657, 410 210 Fax: 00977-1-410 210

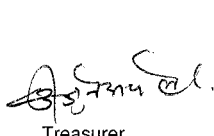
Nepal Geological Society

RECEIPT & PAYMENT ACCOUNT

For the year ended 31st Shrawan 2056

Receipt	Amount (Rs.)	Payment	Amount (Rs.)
To Cash	21,031.00	By Advertisement	12,854.00
To Bank	917,959.67	By Audit Fee	4,000.00
To Advertisement	8,500.00	By Advance A/C	36,000.00
To Advertisement \$477	32,674.50	By E-mail/Internet Service	23,946.00
To Contribution	123,280.00	By Equipment	34,295.00
To Contribution \$7900	541,150.00	By Fuel	682.00
To Life Membership Fee	38,290.00	By Catering Service	81,623.00
To Life Membership Fee \$800	54,800.00	By Bank Commission	549.00
To General Membership Fee	8,150.00	By Computer Service	25,700.00
To General Membership Fee \$20	1,370.00	By Election	12,846.00
To Associate Membership Fee	1,600.00	By Furniture	7,500.00
To Symposium Registration	178,200.00	By Printing	271,512.00
To Symposium Registration \$4425	303,112.50	By Photocopy	12,191.25
To Geological Map Sale	17,350.00	By Postage	83,865.00
To Journal Sale	31,332.00	By Refreshment	8,092.25
To Journal Sale \$335	22,947.50	By Salary & Remuneration	26,635.00
To Journal Subscription \$300	20,550.00	By Repair & Maintenance	12,000.00
To Interest Received	56,329.49	By Stationery	33,034.75
To Miscellaneous Income \$1080.4	74,007.17	By Tax on interest	1,206.54
To Miscellaneous Income (Diff. Exchange rate on Dollar)	2,323.34	By Fax & Telephone	11,741.00
To Symposium Excursion \$5400	369,900.00	By Transportation	5,441.00
		By Rent	8,500.00
		By Miscellaneous Expenses	13,083.67
		By Nepal Bank Ltd. Bhotahity	6,019.23
		By Nepal Bank Ltd. Fixed	37,000.00
		By Nepal Bank Ltd. Current	9,949.27
		By Nabil Saving	16,326.38
		By Nabil Fixed	29,000.00
		By Nabil Dollar A/C \$23932	1,639,342.00
		By ADB Saving	31,971.83
		By ADB Fixed	315,400.00
		By Cash in Hand	12,551.00
Total	2,824,857.17	Total	2,824,857.17

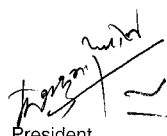
(US\$ 1 = NRs. 68.50)


Treasurer

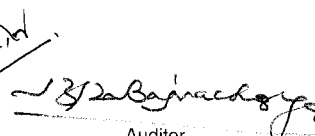
A. Aryal


General Secretary

Uttam B. Shrestha


President

R.K. Aryal


Auditor

Baburaja Bajracharya

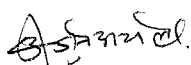
Nepal Geological Society

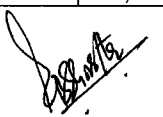
INCOME & EXPENDITURE ACCOUNT

For the year ended 31st Shrawan 2056

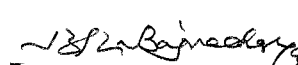
Expenditure	Amount (Rs.)	Income	Amount (Rs.)
To Advertisement	12,854.00	By Advertisement \$477	32,674.50
To Audit Fee	4,000.00	By Advertisement	8,500.00
To Advance	36,000.00	By Contribution \$7,900.00	541,150.00
To Computer Service	25,700.00	By Contribution	123,280.00
To Catering Service	81,623.00	By Life Member Fee	38,290.00
To E-mail/Internet Service	23,946.00	By L.M. Fee \$800	54,800.00
To Equipment	34,295.00	By Ord. M. Fee	8,150.00
To Fuel	682.00	By Ord. M. Fee \$20	1,370.00
To Miscellaneous Expenses	13,083.67	By Associate M. Fee	1,600.00
To Printing and Press	271,512.00	By Symposium Registration	178,200.00
To Photocopy	12,191.25	By Symposium Registration \$4425	303,112.50
To Postage Telegram	83,865.00	By Geo. Map. Sale	17,350.00
To Refreshment	8,092.25	By Journal Subscription \$300	20,550.00
To Salary & Remuneration	26,635.00	By Journal Sale	31,332.00
To Rent	8,500.00	By Journal Sale \$335	22,947.50
To Repair and Maintenance	12,000.00	By Interest Received	56,329.49
To Stationary	33,034.75	By Miscellaneous Income \$1080.40	74,007.17
To Transportation	5,441.00	By Miscellaneous Income	2,323.34
To Fax and Telephone	11,741.00	(Dif. Exchange rate & other)	
To Tax on Interest	1,206.54	By Symposium Excursion \$5400	369,900.00
To Election	12,846.00		
To Furniture	7,500.00		
To Bank Commission	549.00		
To Surplus (income over expenditure)	1,158,569.04		
Total	1,885,866.50	Total	1,885,866.50

(US\$ 1 = NRs. 68.50)


Treasurer
Arjun Aryal


General Secretary
U. B. Shrestha


President
R K Aryal


Auditor
Baburaja Bajracharya

CEMAT CONSULTANTS (PVT) LTD

(Civil, Electrical, Mechanical, Architectural and Transport Consultants)

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Kumari Path, Thapagaon

New Baneshwor, Kathmandu, Nepal

Tel.: 493198, 491439

Fax: 977-1-491598

E-mail: ceamat@wlink.com.np

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- ☐ Water Supply and Sewerage
- ☐ Road, Highways, and Bridges
- ☐ Commercial, Industrial, and other Complexes
- ☐ Power Engineering
- ☐ Urban Planning and Infrastructure Development
- ☐ Mechanical and Industrial Engineering
- ☐ Integrated Rural Development

Services:

- ☐ Preliminary Investigation and Feasibility Studies
- ☐ Assistance in Project Start-up
- ☐ Detailed Engineering, Tendering, and Contract Negotiation
- ☐ Construction Supervision and Quality Control
- ☐ Project Management
- ☐ Socio-Economic and Environmental Studies

बीसौं वार्षिक साधारण सभामा भएका छलफल तथा निर्णयहरू

- सर्वप्रथम भूतपूर्व अध्यक्ष एवं आजीवन सदस्य श्री कृष्ण प्रसाद का लेले पहिलो प्रश्न गर्दै भन्नुभयो- हरेक वर्ष साधारण सभामा कोषाध्यक्षबाट आर्थिक प्रतिवेदन पेश हुने गरेको छ तर हाल ने. भौ. स. संग कतिपय जिन्सी सामानहरू र अन्य लजिष्टिक्स पनि छन् तर तिनीहरू के कस्ता अवस्थामा, कहाँ छन् भन्ने कुराको जानकारी पनि साधारण सभामा प्रस्तुत गर्नुपर्ने । सो प्रश्नको जवाफमा कोषाध्यक्ष श्री अर्जुन अर्यालले जिन्सी सामानहरूबारे सभालाई संक्षिप्त जानकारी गराउनु भयो भने महासचिव श्री उत्तम बोल श्रेष्ठले अर्का आ. व. देखि आर्थिक र जिन्सीको वेगला वेगले अडिट गराउने कुरा व्यक्त गर्नु भयो । त्यस पछि श्री कालेले ने. भौ. स. को लाइब्रेरीको लागि विभिन्न संस्था तथा यूनिभर्सिटीहरूबाट फ्रि तथा एक्सचेन्ज बेसिसमा आउने गरेका किताब र जर्नल, बुलेटिनहरू के कति भए र त्यस्को राम्रो व्यवस्थापन तथा संचालन किन भएको छैन भन्ने प्रश्न राख्नु भएकोमा कोषाध्यक्ष श्री अर्जुन अर्यालले लाइब्रेरीलाई प्राप्त भएका पुस्तक पुस्तिका सबै रेकर्ड गरि राखिएको छ तर exchange को लागि महंगो Postal Charge ले गर्दा अलिकति व्यवस्थित हुन नसकेको कुरा व्यक्त गर्नु भयो ।
- ने. भौ. स. का अर्का आजीवन सदस्य श्री माधवराज पाण्डेले सामाजिक Computer मा Website राखिएको छ कि छैन भन्ने प्रश्न गर्नुभएकोमा पूर्व अध्यक्ष डा. विशालनाथ उप्रेतीले यसमा प्रयास जारी छ र चाडैने Internet राख्ने व्यवस्था हुनेछ भन्ने जवाफ दिनुभयो ।
- यस समाजका अर्का आजीवन सदस्य श्री कृष्ण मुरारी अमात्यको "Geological Map of Nepal" विक्री गरी आएको रकम Fixed deposit मा राख्ने र Research Publication Fund मा खर्च गर्ने काम भयो-भएन भन्ने प्रश्नमा समाजका अध्यक्ष रमेशकुमार अर्यालले यो प्रस्ताव अत्यन्त राम्रो हो तर Journal Publication को लागि नै Fund पर्याप्त नभएको अवस्थामा हाललाई नयाँ फिक्स्ड खाता खोल्न सम्भव नभएको हो भन्नुभयो भने उपाध्यक्ष श्री वासुदेव खरेलले श्री अमात्य जीलाई उहाले Map विक्री गरी जम्मा गर्नुभएको रकम यथाशक्य छिट्टै समाजको बैंक खातामा जम्मा गरिदिन आग्रह गर्नुभयो भने डा. विशालनाथ उप्रेतीले हालसम्म यो रकम थोरै भएको हुँदा र ब्याज पनि कमै आउने हुँदा १-२ वर्षमा Fund बढाएपछि मात्र त्यस्तो गर्न राम्रो हुने कुरा व्यक्त गर्नुभयो । उक्त अवसरमा अर्का सदस्य श्री माधवराज पाण्डे तथा जगदीश्वर श्रेष्ठले हाललाई रकम थोरै भएकाले Scientific Committee ले नै Publication Fund Utilise गर्ने जिम्मा लिने र वेगलै Committee नबनाउने राय पेश गर्नु भयो भने अर्का आजीवन सदस्य एवं Coordinator Scientific Sub Committee का डा. रमेशप्रसाद बस्यालले प्रस्ताव आए वमोजिम Scientific Sub Committee को सिफरिशमा का. का. स. ले Fund Utilise गर्न राम्रो हुने राय व्यक्त भएकोमा सबैको सहमति भयो ।
- यसरी छलफल अगाडी बढाउने कार्यक्रममा यस समाजका अर्का आ. स. डा. मेघ राज धितालले NGS का सबै Publication को copyright आफैले लिनु पर्दछ भन्नु भयो।
- डा. धितालले आजूदो International Symposium का वेला गराईने Field excursion मा नेपाली पनि सम्मिलित हुनसक्ने हुँदा उनीहरूसंग के कति रकम लिने भन्ने बारे उठाउनु भएको प्रश्नमा Nepalese member लाई Subsidise गरी प्रति व्यक्ति रु. १००० मात्र लिने प्रस्ताव केही सदस्यहरूले राख्नु भएकोमा आ. स. श्री नीरेन्द्रध्वज मास्केले लाग्ने खर्चमा Subsidise गर्न नहुने राय व्यक्त गर्नु भयो भने समाजका अध्यक्ष रमेश कुमार अर्यालले यस बारेमा Executive Committee को र Excursion Committee को Coordinator को राय लिएर निर्णय गर्नु वेश हुने राय व्यक्त गर्नु भएकोमा सबै सदस्यको सहमति भयो ।
- ने. भौ. स. का सदस्य श्री महेन्द्र ढुंगेलले International Symposium को लागि Paper माग गर्दा circular मा दिइएको deadline पछि papers प्राप्त भएमा के गर्ने भन्ने प्रश्न राख्नु भएको जवाफमा सो Symposium का संयोजक डा. विशाल नाथ उप्रेतीले हाल सम्म हामीले विश्वका विभिन्न ४२ राष्ट्रबाट थुप्रै Papers प्राप्त गरिसकेको अवस्थामा deadline पछि आएका papers लाई consider नगर्ने निर्णय लिएका छौं भनि जवाफ दिनु भयो ।
- यसरी नै छलफलको कार्यक्रमाई अघि बढाउने सिलसिलामा आ. स. श्री कृष्ण प्रसाद काफ्लेले International Symposium गरेर मात्र पुग्दैन सो को Proceedings पनि समयमै छापिनु आवश्यक छ र Proceedings को कपि सबै Registered Participants लाई पठाउने शर्तमा Registered fee लिइसकिएको हुँदा यथाशक्य छिटो Proceedings Publish गरी उहाहरूलाई पठाउनु पर्छ भन्ने राय व्यक्त गर्नु भएकोमा समाजका अध्यक्ष अर्यालले Proceedings समयमै छापनका लागि एडिटोरियल बोर्ड लगायत अन्य Referee हरूको मुख्य भूमिका हुन्छ । सो Proceedings छापेपछि यथाशक्य छिटै सबै Institutionally Registered Nepalese Participants र Foreign Participants लाई एक कपी पठाइनेछ भनी जवाफ दिनु भयो ।
- कोषाध्यक्षले प्रस्तुत गर्नुभएको आर्थिक प्रतिवेदनको Income and Expenditure Column मा By Advertisement भन्नेमा विदेशी मुद्राको हिसाब Convert गर्दा किन फरक भएको हो भन्ने सदस्य श्री जगदीश्वरनाथ श्रेष्ठको प्रश्नको जवाफमा कोषाध्यक्ष श्री अर्जुन अर्यालले Amount Column ठीक भएको तर Income Column मा By Advertisement पछि केही पनि नहुनुपर्नेमा गल्ती भएकाले सुधार गर्नेछु भनी स्पष्ट पार्नुभयो ।

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on the auspicious occasion of publishing its
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**BRIEF REPORT ON
INTERNATIONAL SYMPOSIUM ON ENGINEERING GEOLOGY,
HYDROGEOLOGY AND NATURAL DISASTERS
WITH EMPHASIS ON ASIA
28 - 30 SEPTEMBER, 1999**

The Nepal Geological Society (NGS) under the sponsorship of the International Association for Engineering Geology and the Environment (IAEG) and endorsed by the International Decade for Natural Disaster Reduction (IDNDR) Secretariat, Geneva, Switzerland, CO-GEOENVIRONMENT(IUGS) and also in association with various national and international organisation organised an **International Symposium on Engineering Geology, Hydrogeology, and Natural Disasters with Emphasis on Asia from 28 to 30 September 1999.**

The Symposium was graciously inaugurated by **His Majesty King Birendra Bir**

Bikram Shah Dev. Her Majesty Queen Aishwarya Rajya Laxmi Devi Shah also graced the occasion.

On the occasion, His Majesty conferred upon the Honorary Membership of the Nepal Geological Society to two distinguished geoscientists, Professor Dr. Koshiro Kizaki (Japan) and Mr Madhav Raj Pandey (Nepal) for their contribution to research and development of geoscience in the Himalayas. Their Majesties also granted audience to the distinguished geoscientists from thirty two countries. The inaugural function was also attended by Mr Yog Prasad Upadhyay, the Rt. Honorable Acting Prime Minister of Nepal and other distinguished persons.



Their Majesties the King and Queen taking Guard of Honour on the occasion of Inaugural Ceremony of the International Symposium on Engineering Geology, Hydrogeology, and Natural Disaster with Emphasis on Asia. Rt. Hon. Acting Prime Minister, Minister for Science and Technology, and the President of NGS were also present on this occasion.

Best Wishes
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His Majesty the King inaugurating the International Symposium in Kathmandu on 28 September 1999

Welcoming the participants Mr R. K. Aryal, President of Nepal Geological Society, expressed his confidence that the outcomes of research/working papers deliberated in the symposium will certainly be a solid contribution towards sustainable infrastructure development.

At the inaugural ceremony, Honorable Minister of State for Science and Technology, Mr Surendra Prasad Chaudhary highlighted on the importance of engineering geology, hydrogeology, and natural disaster prevention and mitigation in a country like Nepal, which is situated in a highly fragile geoenvironment. He also stated that His Majesty's Government of Nepal will give high priority to involve geoscientists in all the governmental organisations responsible for infrastructural development.

On this occasion, President of IAEG, Professor Wang Sijing shed light on the activities of IAEG and expressed his pleasure at organising such a symposium in Nepal.

Convener of the International Symposium, Professor Dr. Bishal Nath Upreti highlighted the status of the International Symposium. He also pointed out that the holding of such a meeting in Nepal provides a forum for the scientists of the region to interact with their counterparts from the developed countries. General Secretary of the Nepal Geological Society, Mr Uttam Bol Shrestha presented vote of thanks.

The Symposium was attended by **419 geoscientists from 34 different countries**. The participants were from the following countries and regions:

SAARC: Nepal (231), Bangladesh (4), India (18), Pakistan (2) and Sri Lanka (2).

Asia-Pacific region: Japan (56), China (7), Iran (3), Israel (4), Malaysia (2), Taiwan (1), Turkey (1), Australia (1) and New Zealand (1).

European countries: Austria (3), Czech Republic (1), Finland (3), France (17), Germany (6), Greece (4), Italy (27), Netherlands (1), Norway (1), Portugal (2), Romania (1), Slovenia (1), Sweden (3) and United Kingdom (5).

African continent: South Africa (1).

North America: United States of America (4) and Canada (2).

South America: Argentina (1), Brazil (2) and Colombia (1).

During the three days of symposium, twenty-three technical sessions were held in three main topics: engineering geology, hydrogeology, and natural disasters.

On the second day of the symposium, a special session on seismology (DMG/Nepal and DASE/France) was conducted. **His excellency, Michel Lummuas, French Ambassador** to Nepal shed light on the twenty years of cooperation in seismology between DMG/Nepal and DASE/France. **Mr N. R. Sthapit**, Director General of the Departments of Mines and Geology, highlighted on the activities of the National Seismological Laboratory and appreciated the cooperation between Nepal and France. Mr R. K. Aryal, President of the Nepal Geological Society, also spoke on the occasion. The special session was chaired by **Mr R. R. Pokhar el, Secretary**, Ministry of Industry,

After the technical sessions, a **valedictory session** was conducted. **Mr Surendra Prasad Chaudhary, Hon. State Minister for Science and Technology**, was the Chief Guest of the session. **Mr Ramesh Kumar Aryal, the President** of the Nepal Geological Society



His Majesty the King presenting Honorary Membership of NGS to Mr Madhav Raj Pandey

chaired the session. At the session, eminent geoscientists from eight countries expressed their views regarding the importance of the Symposium and the achievements that could be gained through such conferences.



His Majesty the King presenting the honorary Membership of NGS to Professor Dr K. Kizaki

After the symposium, a one-day Excursion to

Kathmandu-Kodari-Kathmandu and another four-day Excursion to Kathmandu-Butwal-Pokhara-Kathmandu were also organised. These excursions were attended by 30 and 90 participants, respectively. The excursions were planned to show the participants various engineering geological problems along the mountain roads of Nepal, including visits to hydropower projects, and the general geology of the Nepal Himalayas.

The Executive and Council meetings of the International Association for Engineering Geology and the Environment (IAEG) were also held in Kathmandu prior to the symposium.

A total of **185 scientific research/working** papers including six keynote addresses were presented in the symposium. Out of which, about **110 full papers** have been submitted for publication.

The Society will be publishing the proceedings of the symposium in the Journal of the Nepal Geological Society by the end of 2000. The paper will be reviewed by international referees before publication.



Their Majesties the King and Queen with the 10th Executive Committee Members of Nepal Geological Society

Welcome Speech by R. K. Aryal, President, Nepal Geological Society

Your Majesty the King,

Your Majesty the Queen,

Rt. Hon. Acting Prime Minister, Mr Yog Prasad Upadhaya,

Rt. Hon. Chief Justice, Mr Mohan Pd. Sharma,
Rt. Hon. Speaker, Lower House, Mr Tara Nath Rana Bhat,

Hon. Minister for Science and Technology, Mr Surendra Prasad Chaudhari,

Hon. Heads of the Constitutional Bodies,

Your Excellencies the Ambassadors,

Honorary Members of Nepal Geological Society

President of IAEG, Prof. Wang Sijing,

Distinguished Geo-scientists,

Engineers and Managers,

Distinguished Guests,

Ladies and Gentlemen.

Your Majesty,

We, the geoscientists and engineers are highly grateful to your Majesty for gracefully inaugurating **the International Symposium/Conference on Engineering Geology, Hydrogeology, and Natural Disasters with Emphasis on Asia** organised by the Nepal Geological Society under the sponsorship of International Association for Engineering Geology and the Environment (IAEG).

On this occasion, on behalf of Nepal Geological Society and Geo-scientific Community, I express my heartfelt gratitude to Your Majesty for the Majesty's graceful presence. I also express my hearty gratitude to **Your Majesty the Queen** for Your Majesty's gracious presence.

Your Majesty,

The Nepal Geological Society has emerged as focal point for national and international geo-scientists engaged in geo-scientific research in the Himalayas, and at present the Society encompasses more than 450 national and international members. The Society has regularly bringing out geo-scientific research papers through its publication, **Journal of Nepal Geological Society**.

Your Majesty,

May I humbly inform to Your Majesty that the Nepal Geological Society is awarded **1998 Merituous Certificate for Disaster Prevention** for its effort in disseminating the scientific knowledge and spreading the

awareness of prevention of natural disaster by UN Humanitarian and Emergency relief Coordination Office of IDNDR Secretariat in Geneva.

Your Majesty,

I humbly would like to inform to Your Majesty that about 350 distinguished geo-scientists from 37 countries of the world are participating in this conference. On the occasion I welcome all eminent national and international participants and distinguished guests.

Your Majesty,

The Himalayas are very fragile with complex geological structures. The country has been regularly witnessing the loss of life and property due to natural disasters: earthquake, floods, landslides, soil erosion, and glacier lake outburst floods. On the other hand, construction of infrastructures, harnessing of groundwater resources, and other developmental activities are further escalating the environmental degradation drastically. On the above context the input of geological, engineering geological, geotechnical, hydrogeological knowledge will enhance towards the sustainable infrastructural development and also help in reduction of natural disaster effects.

The conference will provide the participants an opportunity to discuss and deliberate on various aspects of geoscience and bring out with their findings. This will certainly be beneficial to the national as well as international participants.

Your Majesty,

At present, our geo-scientists are directly contributing towards the national development by their involvement in planning and implementation of hydropower projects such as the Kaligandaki and Marsyangdi, highways and roads, exploration and development of mineral resources, and underground water resources. They are also involved in the natural disaster prevention and environmental management.

Your Majesty,

I believe that the scientific papers and reports to be presented in this conference will be immensely valuable and will provide inspiration and guidance to all the participating geo-scientists.

Once again I remain yours, Your Majesties.

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Speech by Professor Dr B. N. Upreti, Convener, International Symposium

Your Majesty the King,

Your Majesty the Queen,

Rt. Hon. Act. Prime Minister Mr Yog Prasad Upadhyaya,

Rt. Hon. Chief Justice, Mr Mohan Pd. Sharma,

Rt. Hon. Speaker, Lower House, Mr Tara Nath Rana Bhat,

Hon. Ministers,

Hon. State Minister for Science and Technology

Mr Surendra Prasad Chaudhary,

Hon. Heads of Constitutional bodies,

Your Excellencies,

Prof. Sijing Wang, President of IAEG,

Mr R.K. Aryal, President of NGS,

Distinguished Participants,

Distinguished Guests,

Distinguished Members of Nepal Geological Society,

Fellow Members of Nepal Geological Society,

Ladies and gentlemen,

Your Majesty,

On behalf of the organising committee, all the members of Nepal Geological Society and on my own, may I take this opportunity to express our heartfelt gratitude to **Your Majesty** for being so kind to grace this occasion and inaugurate the International Conference. We also extend our sincere gratitude to **Your Majesty the Queen** for your graceful presence. It is indeed a historic moment to us. **Your Majesty**, your gracious and august presence has made all the member of Nepal Geological Society, very proud. We are highly encouraged and this occasion has given us a renewed impetus to work harder and with dedication for the development of the country and for the advancement of sciences.

On behalf of the Organising Committee and also on behalf of my own, I also extend a very warm welcome to all the participants. We are greatly honoured by your presence here, in this conference.

Your Majesty,

Nepal Geological Society is a non-governmental professional organisation. It was founded in 1980. We will be observing the 20th

anniversary of its establishment next year in the new millenium. I am very happy to mention here in this august gathering that the Nepal Geological Society is gradually emerging as an important regional scientific organisation. We have organised a number of national and international seminars, conferences and congresses which were attended by scientists from most countries of the region and out side.

We are also happy to see that Nepal Geological Society is gradually entering into the family of international geoscientific community. The Society is the country member of the International Association for the Engineering Geology and the Environment (IAEG). It is also developing its interaction and networking with many other international geological institutions.

Your Majesty,

Our world is faced with many kinds of natural hazards that range from earthquakes, floods, cyclones, landslides and watershed degradation to other environmental problems. The most recent powerful earthquakes in Turkey, Greece and Taiwan remind us how vulnerable we are to natural disasters. Geoscientists have a major role to play in the mitigation of these natural hazards and addressing various environmental issues. Their role in engineering, environmental management, as a partner in sustainable development such as management of water resources, soils, urbanisation, waste disposal, energy sector and natural disaster reductions, have become indispensable.

Your Majesty,

The organisation of this symposium was initiated nearly two years before and was decided that the Nepal Geological Society under the sponsorship of the IAEG will organise it. We are very happy to see that subsequently many international as well as national organisations have joined hands with us. Although the conference is an international event, by virtue of its organisation in this part of the world, it is but

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appropriate that we also focus on issues and problems of Asia.

This international conference was organised in Nepal essentially with the following three main objectives:

- A. Engineering geology has become more and more important in every aspect of our development activities. Developing countries of our region are yet to fully appreciate this reality. Such a meeting will provide forum to the scientists of this region to interact with their counterparts from the developed countries, as well as help to create awareness among our planners and policy makers.
- B. Our region abounds in water resources, both surface and groundwater. The mighty rivers that flow through our region are the true blessings of nature, if properly harnessed. The northern Indo-Gangetic plain forms one of the very large and excellent groundwater reservoirs of the world. Their effective use is of paramount importance in the upliftment of the quality of life of the people in the region. It is hoped that this meeting will bring out the problems and prospects in harnessing these resources and suggest solutions to the problems.
- C. Our region is highly vulnerable to natural disasters. Conferences of such kind will help in wider exchange of information and knowledge between the scientists of many countries towards mitigating these hazards.

We all know science cannot effectively grow in isolation and confinement. We need more interaction, cooperation and collaboration for the development of the science and to face the challenges that lie ahead of us. An earthquake occurring in Pakistan or other parts of Himalaya, has a great bearing to Nepal. Floods in Bangladesh, have a link all the way in the High Himalaya. The enhanced rate of soil erosion in the Himalaya affects the plains of the Ganges and the Indus. It is therefore that we need to be aware of the importance of comprehensive outlook on these problems rather than only looking inwardly and confined within our own premises. Natural processes do not recognise political boundaries. Regular meetings and

exchange of information of research findings will greatly help in better understanding of problems and their remedies.

Your Majesty,

We received over 480 replies from 45 countries in response to our first announcement. Finally, we have now 418 participants from 35 countries attending this conference representing the continents Africa, North and South America, Asia, Australia and Europe. A total of 223 abstracts are accepted for the presentation in the symposium. The papers will be presented in 23 sessions spread over the three days.

The Society has received unfailing support and cooperation from many individuals and organisations to bring this conference at this stage. The IAEG and in particular Prof. P. G. Marinos, the immediate past president, Prof. Wang Sijing, the current President, and all the IAEG country groups from over 60 countries helped us at every stage of the preparation of this conference. International organisations such as UNESCO, UNDP, IDNDR Secretariat, ICIMOD, IUGS, COGEOENVIRONMENT helped us in various ways both in terms of finance and moral support. For the support and encouragement of many Nepalese governmental and non-governmental organisations, engineering consulting companies, and Members of Nepal Geological Society, we remain highly obliged.

I am aware that there has been many shortcomings during the preparation of this conference, and may have caused inconvenience to many participants. As a convener, I take the full responsibility of all these shortcomings, and I sincerely beg for your forgiveness.

To all our honorable participants, once again I welcome to this ancient city of Kathmandu and to the conference. I wish you a very fruitful deliberation in the conference and a pleasant and memorable stay in Nepal. I believe, the Himalaya, this valley of ancient cities and its friendly people will bring you back to this country again and again.

Thank you very much honourable participants and guests.

Your Majesties, I ever remain yours.

Speech by Professor Wang Sijing, President, International Association for Engineering Geology and the Environment (IAEG)

**Your Majesty the King,
Your Majesty the Queen,**

Honorable Ministers,
Distinguished Ladies and Gentlemen,

Human society made a grand leap forward when it put forward and widely accepted the concept of sustainable development. This human wisdom eventually enables us to recognise that the development of human being itself should be in harmony with nature. This issue of sustainable development becomes much more significant nowadays, under the condition of highly advanced state of modern science and technology that allows, to a certain extent, to conquer the nature.

Human being needs agricultural, industrial, and infrastructure development for survival and for improving his living standards. Development has always been emphasised especially in the past dozens of decades. Today, the developing nations profoundly recognise that economic development is the cornerstone of a nation's prosperity. We started in the path of development at any cost.

However, human being soon learned sufficient lessons from the consequences of depletive development. More and more settlements started facing environmental pollution associated with industrial process. Greenery started disappearing, and consequently desert started expanding, and landslides became more frequent, all threatening human life and property. Then the human being started to think about distinguishing the depletive development from the healthy one, and the need of 'self constraint' that harmonises development and the environment. Soon it was realised that, in fact, there is no absolute contradiction between the environmental protection and the economic development. These two aspects are unified by the concept of sustainable development.

When we look at the problems from the point of view of sustainable development, the path becomes very wide and complex. But, as a Chinese poem of Tang Dynasty said, 'The mountains and rivers seem to be ending without a way out, but a new village appears behind the poplars, willows and flowers', the modern science and technology has come to help us to implement the goal of sustainable development.

Engineering Geology is such a branch of modern science and technology, which is aiming in realising the approach of sustainable development through the coordination of human engineering activity and the geoenvironment. The Declaration issued by the International Association of Engineering Geology in 1980 at the 26th International

Geological Congress in Paris had stated that the engineering geologists should undertake the task of environment protection and its rational use. The statutes of the International Association of Engineering Geology also clearly states that Engineering Geology is devoted to the investigation, study and evaluation of the geological and environmental problems resulting from the interaction between human works and activity, and the geology, as well as to the prediction and development of measures for prevention and mitigation of natural hazards. It is important that our Association has changed its name into the International Association for Engineering Geology and the Environment. Therefore, the engineering geologists should ensure the economy and safety of infrastructure construction and exploitation of mineral resources, and equally ensure the environment quality and safety.

Today, much advancements and innovations have been achieved in the fields of engineering geosciences. The methods of engineering evaluation of the geoenvironment, geo-environmental engineering planning and management, hazard prediction and prevention, are being perfected and implemented. Today, we are pleased to gather in the country of Himalayan Mountains to exchange the outcomes of the researches in engineering geology, hydrogeology and environmental geology, and to implement the approach of sustainable development. The Himalayas and the surrounding regions are composed of high mountains and deep canyons. Active geological processes, with very intense tectonic processes, which are comparable to only few regions in the world, have resulted in serious geological hazards and sensitive geoenvironment. However, sustainable development of this region can yet be achieved by utilising the knowledge of engineering geology, hydrogeology and environment geology. We do hope that this symposium will greatly promote the advances of the engineering and environment geosciences in this region, in Asia and over the world.

Many thanks to the Organising Committee of this Symposium and the Nepal Geological Society for their great efforts in holding this meeting, in offering the opportunity for all of us to be gathered here in this old and beautiful country, to meet our new and old friends in Kathmandu.

I sincerely wish the symposium great success and wish all of you an enjoyable and successful meeting. I wish every body a good health.

Thank you for your attention.

Speech by Mr Surendra P. Chaudhari **Hon. State Minister for Science and Technology**

Your Majesty the King,
Your Majesty the Queen,

Rt. Hon. Chief Justice, Mr Mohan Pd. Sharma,
Rt. Hon. Speaker, Lower House, Mr Tara Nath
Rana Bhat,

Hon. Ministers,

Your Excellencies the Ambassadors,

President of International Association for
Engineering Geology and the Environment,

President of Nepal Geological Society,

International and National Geoscientists,

Distinguished Guests, Ladies and Gentlemen,

I wish to thank the organiser of this
“International Symposium on Engineering
Geology, Hydrogeology and Natural Disasters
with emphasis on Asia” which has been
gracefully inaugurated by His Majesty the King.

I am happy to note that the International
Association for Engineering Geology, and the
Environment (IAEG) has chosen Nepal to hold
such an international event with emphasis on
Asia. This event is remarkable that more than
350 geoscientists from 36 countries of the
world are participating in this symposium to
present and discuss the results of their research
relating to different aspects of engineering
geology, hydrogeology, natural disasters, and
environment.

All we know that the Himalayan range is a
young mountain system with fragile terrain
formed due to the collision of Indian and Asian
plates. The continental subduction phenomenon
is active still at present time and our Himalaya
is rising at the rate of one to two centimeters per
annum. It is a highly seismic prone and
neotectonic region.

We in Nepal have encountered all the
problems of engineering geology and natural
hazards due to the geological history of our
terrain. We have witnessed the failure of bridges
as in Butwal or Pokhara, the slope instability and
collapse of roads as in Dhangadi-Dandeldhura
road, the glacier lake outburst flood (GLOF) as
in Salleri. There is a considerable loss of life and

property due to landslides, debris flows and
floods every year in Nepal. The environmental
degradation is noticeable due to heavy soil
erosion all over the country.

Our geoscientists are actively engaged in
every projects of infrastructural development as
hydropower, road, irrigation and town planning.
They contribute in mineral resources
development and geological survey also. For
example, our geologists/geotechnical engineers
are engaged presently in Kali Gandaki A, Middle
Marsyangdi, Khimti and other hydropower
projects from the feasibility study to construction
phases. His Majesty's Government of Nepal
attributes a high priority for geotechnical study
of infrastructure development. The government
will consider to employ the geologists at all the
concerned organisations dealing with
infrastructure development.

Due to the intense seismic activities in our
region, His Majesty's Government has installed
21 sophisticated seismic stations in Nepal with
the assistance of the government of the Republic
of France. The National Seismological Centre at
Department of Mines and Geology conducts
seismo-tectonic research and monitors the
earthquakes of the Himalayas. I believe, you have
a special session dedicated to this topic in your
symposium.

In present context, we attach a very high
importance to this symposium. I hope the
prominent geoscientists gathered here will have
a fruitful discussion on their research work and
contribute to the understanding of natural hazard
phenomenon and role of engineering geology for
our development endeavours. I congratulate the
Nepal Geological Society for organising an
international symposium of this kind in Nepal. I
would like to thank all the geoscientists from so
many friendly countries for coming to participate
to Kathmandu for participation.

I wish for a very successful deliberation.

Thank you.

Vote of Thanks by Mr U. B. Shrestha, General Secretary, NGS

**Your Majesty the King,
Your Majesty the Queen,**

Honorable Heads of the Constitutional Bodies,
Honorable Ministers,
Your Excellencies,
President, International Association for
Engineering Geology and the Environment,
Distinguished Guests,
Ladies and Gentlemen,

Your Majesty,

It is indeed a matter of immemorable event for all of us to be here in this marvellous opportunity to welcome our beloved King and Queen in this International Symposium on Engineering Geology, Hydrogeology, and Natural Disaster with emphasis on Asia. We are very much cherished and pleased by the presence of His Majesty the King and Queen in this auspicious ceremony. On behalf of the Nepal Geological Society, Organising Committee of the International symposium and on my own, I take this privilege to express our sincere gratitude to our beloved King and Queen.

We are highly grateful to Your Majesty for kindly awarding the Honorary Membership Certificates of Nepal Geological Society to two distinguished scientists: Professor Dr Koshiro Kizaki of Japan and Mr Madhav Raj Pandey of Nepal. My congratulations to Professor Kizaki and Mr Pandey.

I extend my hearty thanks to all the Honorable Heads of Constitutional Bodies and Ministers for their valuable presence in this conference. I am especially thankful to

Honorable State Minister for Science and Technology, Mr Surendra Prasad Chaudhary for his valuable speech.

I also extend my sincere gratitude to Your Excellencies, Vice-chancellors, Mayor of Kathmandu Metropolitan City, and high-ranking officials of His Majesty's Government of Nepal for being with us in this ceremony.

The Society is very grateful to the President of International Association for Engineering Geology and the Environment (IAEG) for sponsoring the Conference.

I also offer my sincere thanks to various Government agencies, national and international agencies, consulting firms/business groups, Journalists as well as individuals for providing technical, logistic, and financial support to organise this Conference, and hope that they will continue to support in future.

I offer my special thanks to the management of Birendra International Convention Centre for kindly providing necessary facilities.

I would like to give thanks to all Society members for their continued cooperation and support in organising this Conference.

Finally, I express my hearty thanks to all the participants of this Conference, particularly international participants for the painstaking efforts, which they have made to attend this Symposium. I wish them comfortable stay in this country.

We offer our sincere apologies for inconveniences that might have arisen during this programme.

Thank you all.

सभक्तिपूर्वक कृतज्ञता ज्ञापन

श्री ५ माहाराजाधिराज वीरेन्द्र वीर विक्रम शाहदेव सरकारको जुनाफमा
नारायणहिटी राजदरवार

सरकार,

मौसुफ सरकारका करकमलबाट नेपाल भौगर्भिक समाज तथा अन्तर्राष्ट्रिय इन्जिनियरिंग जियोलजी तथा पर्यावरण संघ (International Association for Engineering Geology and the Environment) को तत्वावधानमा आयोजना भएको, विशेषतः एशिया महाद्विपमा केन्द्रित, इन्जिनियरिंग जियोलजी, हाडडोजियोलोजी तथा प्राकृतिक प्रकोप सम्बन्धि ३ दिने अन्तर्राष्ट्रिय सम्मेलनको मौसुफ सरकारबाट असिम निगाह बक्सी समउद्घाटन गरिबक्सेकोमा हामी सम्पूर्ण भूवैज्ञानिक गौरवान्वित भएका छौ ।

सरकारको ओजस्वी व्यक्तित्व र प्रेरणादायी उपस्थितिबाट सम्पूर्ण सहभागी वैज्ञानिकहरुमा हौसला वढाई बक्सेकोमा सरकारमा म नेपाल भौगर्भिक समाज तथा सम्पूर्ण भूवैज्ञानिक समुहको तर्फबाट सरकारमा सभक्तिपूर्ण हार्दिक कृतज्ञता ज्ञापन गर्दछु ।

विन्ति चढाउने

(रमेश कुमार अर्याल)

अध्यक्ष

नेपाल भौगर्भिक समाज

पो.ब.नं.: २३१

फो. नं. : ४१४३३० (अ.) ४७१३७२ (नि.)

फ्याक्स : ४१४८०६

इमेल : nepgeosoc@wlink.com.np

सभक्तिपूर्वक कृतज्ञता ज्ञापन

श्री ५ बडामाहारानी ऐश्वर्यराज्य लक्ष्मी देवी शाह सरकारका जुनाफमा नारायणहिटी राजदरवार,

सरकार,

श्री ५ माहाराजाधिराज सरकार विरेन्द्र वीर विक्रम शाहदेब सरकारका करकमलबाट नेपाल भौगर्भिक समाज तथा अन्तर्राष्ट्रिय इन्जिनियरिंग जियोलजी तथा पर्यावरण संघ (International Association for Engineering Geology and the Environment) को तत्वावधानमा आयोजना भएको, विशेषतः एशिया महाद्विपमा केन्द्रित, इन्जिनियरिंग जियोलजी, हाडडोजियोलोजी तथा प्राकृतिक प्रकोप सम्बन्धि ३ दिने अन्तर्राष्ट्रिय सम्मेलनको समउद्घाटन समाहरोमा श्री ५ बडामाहारानी सरकारबाट समउपस्थितिको लागि निगाह बक्स भई सम्पूर्ण सहभागी वैज्ञानिकहरुमा हौसला वढाई बक्सकोमा सरकारमा म नेपाल भौगर्भिक समाज तथा सम्पूर्ण भूवैज्ञानिक समुहको तर्फबाट सरकारमा सभक्तिपूर्ण कृतज्ञता ज्ञापन गर्दछु । विन्ति चढाउने

(रमेश कुमार अर्याल)

अध्यक्ष

नेपाल भौगर्भिक समाज

पो.ब.नं.: २३१

फो. नं. : ४१४३३० (अ.) ४७१३७२ (नि.)

याक्स : ४१४८०६

इमेल : nepgeosoc@wlink.com.np

मिति

महाशय,

श्री ५ महाराजधिराज सरकारका हजूरमा तपाईंले मिति २०५६.७.८ मा चढाउनुभएको विन्तिपत्रको व्यहोरा मौसूफका हजूरमा जाहेर भएको व्यहोरा सधन्यवाद अवगत गराउँदछु ।

भवदीय,

(डा. चेतबहादुर कुवर)

श्री ५ महाराजधिराजका प्रमुख निजी सचिव

श्री रमेश कुमार अर्याल
अध्यक्ष, नेपाल भौगर्भिक समाज
पो. व. नं. ६८३
काठमाडौं ।

Best Wishes
and
Hearty Felicitations
to
Nepal Geological Society

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International Decade for Natural Disaster Reduction (IDNDR Day, 13 October 1999) National Meetings cum Technical Seminar on Prevention Pays

To commemorate the UN declared **International Decade for Natural Disaster Reduction (IDNDR) Day 1999**, Nepal Geological Society in collaboration with HMG/Ministry of Home, IDNDR National Committee Nepal, UNDP-Nepal, Disaster Mitigation Support Programme Project (DMSP), National Society for Earthquake Technology, Nepal and Lutheran World Federation/ Nepal organised one-day National Meeting cum Seminar on **Prevention Pays** in the auditorium of Russian Cultural Centre, Kamal Pokhari, Kathmandu on 13 October 1999. It was attended by more than 250 participants from various government and Non-government organisations and educational institutions. The inaugural session was chaired by Mr P. P. Pokharel, Secretary, Ministry of Home. Honorable Home Minister, Mr P. B. Khadka, could not come because of his tight schedule, and his message was read by Mr A. M. Dixit, Coordinator of IDNDR. Mr P. B. Malla, Honourable Member of NGS, inaugurated the seminar. Mr R. K. Aryal, President of NGS delivered a welcome speech and highlighted the activities carried out by the Society in the past, in the beginning of the programme. Mr A. M. Dixit, Coordinator of IDNDR Council, NGS, highlighted the concept of IDNDR and activities carried out in different countries. Mr N. R. Sthapit, Director General, Department of Mines and Geology, Mr Mohan Bahadur Karki, Joint

Secretary, Ministry of Science and Technology, Mr Koji Kamee, Chief Advisor, Disaster Mitigation Support Programme Project, Kathmandu also gave their views about IDNDR day and activities carried out by their organisations with respect to disaster prevention and management.

The UN has declared the year 1991-2000 as the International Decade for Natural Disaster Reduction. Second Wednesday of October is the IDNDR Day. Nepal Geological Society is responding UN declaration since 1991 by organising one day national meeting cum seminar every year. NGS on request of UN/DMS has also prepared a data base on Disaster Management Capabilities in Nepal 1997, published awareness booklets, posters and organised training to the school teachers in the past.

The inaugural session of national meeting cum Seminar was followed by a Technical Seminar on **Natural Disaster Prevention in Nepal**. In this seminar eight technical papers were presented by the professionals of various disciplines in two technical sessions on various aspects related to disaster, and environmental degradation.

All the speeches of the guests and the abstracts of all the eight papers presented in the seminar are included in the following pages.

Best Wishes
and
Hearty Felicitations
to
Nepal Geological Society



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Welcome Speech by Mr R. K. Aryal, President, the Nepal Geological Society

Respected Chairman, Mr Padam Prasad Pokharel,
Secretary, Ministry of Home,
Ms. Saraswoti Menon, Deputy Resident Representative,
UNDP/ Nepal,
Mr Mohan Bahadur Karki, Joint Secretary, Ministry
of Science and Technology,
Mr Nanda Ram Sthapit, Director General, Department
of Mines And Geology,
Mr Koji Kamee, Chief Adviser, DMSP/NEPAL,
Mr A. M. Dixit, Coordinator, IDNDR- Committee,
NGS, and Secretary -General, NSET-Nepal,
Honourary Members of Nepal Geological Society,
Distinguished Guests,
Ladies and Gentlemen,

It is my great pleasure to welcome you all in this National meeting cum seminar organised by Nepal Geological Society on the occasion of IDNDR Day - 1999. This meeting and the following seminar is being organised in cooperation with several institutions and forms a part of the National Programme of the IDNDR National Committee, Nepal.

We thank you very much for kindly accepting our invitation to attend this programme. We are particularly thankful to the Chief Guest Honorable Purna Bahadur Khadka, Minister for Home Affairs, Information & Communications and Chairman of the IDNDR National Committee, Nepal, for being with us this morning, despite his busy schedule.

We all know that the UN General Assembly in 1989 had declared the decade of 1990-2000 as the International Decade for Natural Disaster Reduction, and the Second Wednesday of October as the International Day for Natural Disaster Reduction. The Day is observed by the global community, and in this context, we are observing this day today.

Nepal Geological Society has been actively observing the IDNDR Day in close cooperation with the IDNDR National committee-Nepal, since the very first Year of the IDNDR Decade, i.e. since 1990. The Society has been putting its efforts to spread the ideology of IDNDR through a permanent council within the Society, the NGS-IDNDR Council.

As a consequence, it has drawn national focus and at present several government and non-government organisations are actively involved in this programme.

It gives me immense pleasure to inform you that in recognition of efforts of Nepal Geological Society to spread the ideas of IDNDR in Nepal, the jury of 1998 UN Sasakawa Disaster Prevention Award has awarded the Society the Meriteous Certificate for the Disaster Prevention for 1998. We are thankful to UN Humanitarian and Emergency Relief Coordination Office of IDNDR Secretariat in Geneva for the recognising our work.

The UN theme of the IDNDR Day for this year is 'PREVENTION PAYS'. Indeed, this particular theme is very much relevant and largely signifies the role of preventive aspect of disaster management including mitigation and preparedness during pre- as well as post-disaster periods.

Prevention really does pay. This has been proven successful in so many developed, as well as in developing countries. For example, resettlement of victims of natural disaster costs money, time, and efforts of several institutions. Even then the question of long-term sustainability is often doubtful. In order to avoid such circumstances, identification of hazard prone areas on the basis of its vulnerability analysis, and zoning of habitation areas must be done. The zoning should be implemented, at least in the new area so that less number of people and properties are exposed to the extremes of disaster. Such preventive measures adopted will certainly pay off in the long term. But, such programmes of disaster prevention need to be made a culture of the society and recognised appropriately at the policy levels.

Successful disaster prevention is an endeavor that involves all people and institutions in the country. Therefore, multi-disciplinary approach needs to be adopted. This is the key to make disaster prevention a success.

Even though the decade of IDNDR is coming to an end, the Nepal Geological Society that had contributed to the successful accomplishment during the decade would continue in coming days also. I propose that the NGS IDNDR Council should be renamed and reorganised in the form of a Working Group on Natural Disaster Reduction of the Nepal Geological Society. It is realised that the lessons and experiences of the past Decade will pave the way for future activities of the Society.

In this context, I urge His Majesty's Government of Nepal to provide a continuity to the work of the IDNDR National Committee, albeit with a different name. The National Action Plan prepared by the IDNDR National Committee and endorsed by His Majesty's Government of Nepal also seeks to establish such a national body.

As in the past, this meeting will be followed by the technical sessions in which various aspects on natural disasters will be presented and discussed. I do hope that the seminar will pave the way for looking at and mitigating natural disasters in a wider framework by bringing together all the concerned professionals to such common platform.

I also hope that this meeting will certainly bring out outlines of new programmes and guidelines required for Natural Disaster Reduction in Nepal.

Once again I extend a very warm welcome to you all and thank you very much.

Speech by Mr Amod Mani Dixit, Coordinator, NGS IDNDR Council, and General Secretary, National Society for Earthquake Technology - Nepal

**Mr Chairman,
Respected Chief Guest,
Distinguished Guests,
Dear Friends,
Ladies and Gentlemen,**

IDNDR HAS DONE MUCH TO THE COUNTRY

Nepal has gained much from the IDNDR concept and activities.

- Awareness level has increased, publications, use of media, disaster journalism
- Multidisciplinary and multi-sectoral approach has been accepted in principle
- Emphasis on pre-event planning and preparedness has been recognised
- Partnership and synergy developed
- Hazard maps prepared
- National capabilities assessed
- Building Code Prepared, other guidelines prepared
- National Action Plan prepared and partly implemented
- on concrete terms, risk engineering being implemented in linear infrastructure, new design methods developed and implemented
- Researches conducted and used
- GLOF Risk Reduction in progress
- Training conducted by government and non-government/academic institutions
- Specific works conducted in areas of earthquake scenario development and risk management planning

There are many other achievements. So, we have much to be proud of.

NEPAL GEOLOGICAL SOCIETY

- We are part of the process
- A personal communication with UNDP-Nepal and UNDRO back in 1989 following the devastating 1988 Udaypur Earthquake resulted in a spark - the tremendous potentials of IDNDR concept in Nepal was recognised and the Nepal Geological Society started

working to propagate IDNDR ideals in Nepal through the NGS IDNDR Council.

- NGS and also NSET and other professional societies contributed also as the members of the IDNDR National Committee in developing the National Action Plan or in the national delegation to Yokohama and other international meetings.
- IDNDR Days have become synonymous with NGS
- Award of Merits received from the United Nations

BUT DISASTERS ARE ON THE INCREASE

- Disaster Risk is on the increase because of growing exposure and vulnerabilities
- The preceding 12 months witnessed loss of more than 100 lives and a damage of more than 61 crores of rupees. This is only the direct loss
- Some years back, the figures were much less
- Relief funds allocated for the same period amounted to 2.5 crores
- Obviously the benefit - cost ratio of relief measures does not compare with the established B/C ratio of mitigation and preparedness that runs anywhere from 10:1 to 1000:1
- We can not afford to catch up with such trend, it is a luxury too expensive for a developing country

WHAT DID WE LEARN?

- We are not alone, the Asia Pacific region suffers from similar problem
- Many countries have tried prevention measures, and they were successful
- Questions asked whether disaster is really man-made. Because the scale of disaster is proportional to the level of organisation of preparedness measure a society has.
- Turkey and Taiwan are example
- This learning reflected in the GENEVA Mandate for a safer world in the 21st century that emphasises on

- foster a culture of prevention
- proactive rather than reactive approach
- multi sectoral and interdisciplinary approach
- community participation

POSSIBLE STRATEGIES

- We have achieved much, but there are many works that need to be done
- We have to look into all spheres: from policies to awareness to planning, assessment to implementation, training and education
- Existing policies have brought us to this level, but we need to see if we can improve it further. And possibilities are there. Building code is an example. Then comes the Building permit process
- We may like to look into the Natural Calamity Relief Act and incorporate the above-mentioned approaches
- Possibly we need to organise the 2nd National Conference on Disaster Management?
- Possibly we need to review the National Action Plan to update it
- Possibly we need to prepare a planning document for training and education, awareness raising
- Possibly we need to develop long-term vision say for 20 years: Can we state there we will reduce unnecessary deaths from natural events within the next 20 years? Perhaps we can.

IDNDR IS CLOSING BUT DISASTERS NEED CONTINUED ATTENTION

- Even if IDNDR closes, we need to work in this field
- Since our national committee was successful, there should be a continuity to it in this or that form
- But it should be a comprehensive body that could look after all phases of disaster management from hazard mapping to assessment and preparedness to rehabilitation

and reconstruction

- Should be mandated to oversee that risk management is incorporated into the development planning
- Should constantly oversee that our strategies confirm to what lessons have been learned globally
- The Central Disaster Relief Committee obviously does not fulfil such role

I extend my thanks to NGS for giving me the responsibility to serve as the coordinator for the whole decade. It was an immense responsibility, and it is for you all to judge my work. I would like to thank all the NGS INDDR councilors for their wisdom and cooperation extended to me for implementing the IDNDR-related initiatives. All the executive committees of the Society during the Decade were always helpful. I wish to thank them all.

I would like to thank the Disaster Management Unit of the Home Ministry for the faith in us, for the cooperation extended. I would like to thank here Mr Secretary, Dr. Poudyal for your guidance to us. Here I would like to thank the previous secretaries Mr Rebati Raman Pokhrel and Mr Bhoj Raj Pokharel, and also Mr Jnan Kaji Shakya and Mr Sushil Rana, the former chiefs of the Special disaster Unit for their wisdom and guidance.

We always received encouragement from the Disaster Management Office of the UNDP Nepal. I wish to thank Mr Bill Beger who always assisted us in developing our vision, and to Mr Man Bahadur Thapa for

We also would like to acknowledge the intellectual and financial assistance and cooperation received from the office of the Water Induced Disaster Prevention Technical Centre and the JICA Experts, who endorsed our vision and were always ready to assist us in our endeavor.

Thank you.

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Speech by the Chairman, Mr P. P. Pokharel, Secretary, Ministry of Home

Honourable Chief Guest,
Distinguished Guests and Participants,
Ladies and Gentlemen,

At the outset, I would like to thank the organisers of this seminar for inviting me to chair this inaugural ceremony.

As in the past today we are celebrating the International Decade for Natural Disaster Reduction (IDNDR) day organising several activities throughout the kingdom upon the call of IDNDR National Committee chaired by Hon'ble Home and Information and Communication Minister. Today's meeting and the seminar are a part of those activities.

Looking back on the past Decade of the IDNDR, we should recall the emphasis of United Nations resolution on the importance of adopting an integrated approach for disaster management in all its aspects to initiate a process towards a global culture of prevention. Keeping in view the UN resolution we should decide what measures are necessary, feasible and affordable. Most importantly, disaster mitigation can not be accomplished in isolation. Therefore hazard awareness and risk management practice will have to be incorporated into national planning process. Moreover, in the context of our country, disaster management course has to be included in the school and university curriculum.

I believe that a composite effort of all people and information sharing is very necessary for an effective disaster management. We should not wait for something to happen first rather we should be well prepared beforehand.

We should not forget the fact that the future before us still poses the challenges of natural disasters and we must be able to meet those challenges by raising public awareness and technology development. There should be advances in managing the natural disasters.

The Decade has provided an important national, regional and international focus on disaster mitigation. Disaster prevention is a process that sustains by the informed decisiveness of political commitment, mass education and public awareness.

Effective disaster management for the future can only proceed if it is multi-sectoral, but yet integrated in the development planning and resource allocation that reflects public aspirations. Nepal Geological Society admirably serves to demonstrate what is being accomplished in the past as well as what has to be done in the future. I am confident that Nepal Geological Society demonstrates both the feasibility and the reach necessary to work towards a safer 21st century. It is appreciable that this seminar includes together many important disaster management actors. While I would like to thank our chief guest Honourable Minister of Home and Information and Communication for his august presence here and for his inspiring speech on this occasion. In addition, I would like to express my gratitude to DPTC/UNDP/LWS and N-SET for their contribution to make this programme a success.

Thank you.

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Speech by Ms Saraswathi Menon, Deputy Resident Representative (Programme), UNDP

Honorable Mr Chairman,
Hon. Chief Guest,
Distinguished Guests,
Ladies and Gentlemen,

It is an honor for UNDP to join HMG and the people of Nepal in commemorating World Disaster Reduction Day. Today we mark not only the World Disaster Reduction Day but also the end of the International Decade for Natural Disaster Reduction, 1990-2000. The theme for today's observation is Prevention Pays.

There are few events that draw the world community together like a natural disaster. Disasters destroy lives, livelihoods and the well-being of so many people. Our hearts go out to those who have suffered. Financial and volunteer support cross boundaries and political tensions to help people rebuild their lives. In the past year we have known particularly serious devastations/ floods in China, Bangladesh and India, hurricanes in the Caribbean and the Americas, forest fires in the Indonesia and Brazil, earthquakes in Turkey, Greece and Taiwan. The climatic force of El Nino has spanned continents. It would seem that nature has been on a rampage. In 1998 alone, 50,000 people lost their lives and losses to the economy accounted to \$90 million. This is a cost the world cannot afford.

Today as we meet, the people are marking this day in countries all over the world. We recognise that we can and must act jointly to minimise the damage. We can and must jointly develop and foster effective disaster reduction measures. World Disaster Reduction Day provides an opportunity for all of us to reflect and to act. Allow me to make three points in this context.

First we are more vulnerable to natural disasters because of our own actions. Rapid urbanisation, environmental degradation and degradation of natural resources, climatic change and aging infrastructure- all contribute to natural disasters. The forest fires in Indonesia were the result of indiscriminate commercial logging. The floods in China were the result of a pattern of unsustainable development, which the Chinese leaders have now declared the source of the problem. We must change our patterns of

development if we want to prevent rather than aggravate disaster.

Secondly, we must build on our community's own knowledge. Traditional practices often protect the environment. We need to rely and promote the resources of the community. UNDP has been supporting HMG in a programme to implement community led disaster mitigation and awareness raising in the districts of Chitwan and Kavre. Through their efforts community in the programme have prevented floods and landslides. We are expanding the programme to Syangja and Bardia. The Community themselves are resource for the country- they are training others and international organisations like the Red Cross are learning from them. I am happy to note that women are taking the lead in these programmes.

Third, system of all types need to be strengthened. UNDP is supporting HMG to develop standard operating procedures to respond to future disaster and to train human resources and develop capabilities in government, agencies and among the people. UNDP serves as a clearinghouse for the UN system and international doors for information exchange enabling a coordinated response from the international community to disasters. UNDP has, since early 90's been coordinating with donors and government organisations through sectoral working groups such as food, health, and logistics. We also need to expand on systems of knowledge to develop a coherent response. Support to professional organisations such as the Nepal Geological Society is critical in building better scientific knowledge of the causes and consequence of disaster.

In conclusion, if we fundamentally adopt own development strategies to be more sensitive to the environment and protect our natural resources; if we base our strategies on the strength and awareness of the community; and if we develop systems that work, we will go a long way not just to mitigate disasters but also to prevent them. Prevention does pay dividends. At the end of the International Decade for Natural Disaster Reduction we know more about what to do. Now we need to act.

Speech by Mr Koji Kamee, Chief Advisor, Disaster Mitigation Support Programme Project, Kathmandu

Mr Chairman and Secretary, Ministry of Home,
Honourable Chief Guest,
President of Nepal Geological Society,
Coordinantor, IDNDR Council, NGS,
General Secretary, Nepal Geological Society,
Deputy Resident Representative UNDP/Nepal,
Country Representative, Lutheran World Federation, Kathmandu,
Distinguished Guests,
Participants,
Ladies and Gentlemen.

It is a great privilege for me to have this opportunity to say a few words on the occasion of this National Meeting cum Seminar on "Prevention Pays" organised by the Nepal Geological Society to mark this International Decade for Natural Disaster Reduction (IDNDR) day.

Allow me first to congratulate the Ministry of Home/HMG, UNDP/Nepal, Lutheran World Federation/Nepal and NSET/Nepal for jointly collaborating with the Nepal Geological Society along with the Water Induced Disaster Technical Centre (DPTC) to make this important day meaningful and also fruitful.

I find that the theme of this National Meeting cum Seminar "Prevention Pays" is very appropriate to this occasion, as it reflects a shift from the primary focus on post-disaster relief and rehabilitation aspects of the past. It is also conventional wisdom to say that "Prevention is better than cure". Of course, natural disasters as such may never be prevented, but peoples' awareness combined with preparedness at community and institutional levels can contribute a lot to prevent much unnecessary damage to life and property in the event of a natural disaster.

As water induced disasters are very common to both Nepal and Japan, the Government of Japan has been cooperating with His Majesty's Government of Nepal through the Japanese International Cooperation Agency (JICA) for the past eight years in this field. The First Phase of cooperation helped to establish the Water Induced Disaster Prevention Technical Centre (DPTC) in 1991. Certain infrastructures like the office building and Hydraulic and Material Laboratory at Godawari have been put in place. Some technologies suitable for Nepal in the area of landslide mitigation, river control and sabo engineering have been experimented with the joint efforts of JICA experts and Nepalese technical personnel. Certain guidelines for the application

of appropriate technologies have been developed and drafted. Training has been provided to HMG personnel of various departments in Nepal as well as Japan Maintenance of a disaster data base and dissemination of disaster information and awareness through international, national and district level seminars have also been achieved during the previous DPTC project.

Since 1st September, 1999, the next stage project "Disaster Mitigation Support Programme Project (DMSP)" has been launched in Nepal for a period of 5 years with the cooperation of the Government of Japan through JICA. The focus of the DMSP in line with the theme of this National Meeting cum Seminar "Prevention Pays", as it stresses also the software aspects at community level such as advocacy and education among its various activities, which are also very important for the prevention of disaster. The overall goal of the DMSP project is to strengthen the capability of HMG/N and communities to cope with water induced disasters. The expected outputs of the DMSP project are;

- Identification for disaster mitigation measures and construction methods suitable for local environment.
- Strengthening of disaster rehabilitation measures through technical support.
- Improving the sharing of disaster information and mitigation technology.
- Raising awareness on disaster mitigation among HMG/N organisations and communities.

You may find some more information on the planned DMSP Project activities in the single paper handed out to you. And you are always welcome to contact DPTC for further information.

Finally, I would like to thank the Nepal Geological Society for organising this National Meeting cum Seminar. I am most grateful to all these organisations who have collaborated with the Nepal Geological Society to organise this event. I firmly believe that this IDNDR will further strengthen the national and international communities to reduce the impact of natural disasters throughout the world.

Last but not least, even though this IDNDR day is the last one as we approach the end of the decade designated by the United Nations, let us all resolve to continue our efforts at reducing natural disasters well into the coming century and millennium.

Thank you!

**Speech by Mr N. R. Sthapit, Director General
Department of Mines and Geology, Ministry of Industry, HMG/Nepal**

Respected Chairman Mr Padam Prasad Pokharel,
Secretary, Ministry of Home,
Ms Saraswathi Menon, Deputy Resident,
Representative, UNDP/Nepal,
Mr Mohan Bahadur Karki, Joint Secretary,
Ministry of Science and Technology,
Mr Koji Kamee, Chief Adviser, DMSP/Nepal,
Distinguished Guests,
Ladies and Gentlemen,

I am thankful to the organisers of this meeting cum seminar for providing me this opportunity to address this august gathering. We are here to observe the IDNDR Day -1999.

In 1989 the UN General Assembly declared the decade of 1990-2000 as the International Decade for Natural Disaster Reduction. It has helped to draw attention to channelise the efforts of all governmental and non-governmental organisations towards solving the problems of various aspects of disaster management.

The Department of Mines and Geology, in keeping with the national goal of His Majesty's government to create a safe and secure habitat for the Nepalese people where every member of the society can enjoy the fruits of development. The Department is also active in various fields of disaster management.

Since its establishment, DMG has been carrying out systematic geological investigation of the country not only for mineral exploration but also to provide baseline data and information for planners and decision makers for sustainable planning of various development infrastructures such as roads, dams, irrigation canals and bridges. We have been engaged in geological and engineering geological investigation of Kathmandu and Pokhara valleys as well. The Department's work is in the area of mitigation. We prepared hazard maps and risk maps. The information contained therein helps the designers and project planners to avoid hazardous areas, or if not possible to avoid, to design the infrastructure adequately to withstand the potential hazards. We, thus are helping towards integration of geological knowledge for sustainable development.

One of the important activities of the Department of Mines and Geology is the activity of the National Seismological Network. Scientists of this department acquire real time data on earthquake occurrence, interpret the data for developing the earthquake catalogue and for better understanding of the geological structure of the Himalayas.

The seismological information is shared with international seismological centres. Thus the Nepal

Network is assisting the global community to better understand the global seismicity. We are thankful to the Government of France for consistently providing us assistance since the very establishment of the first seismograph of the network some two decades ago.

The Department of Mines and Geology is closely working with the Nepal Geological Society. We are thankful to the Society for publishing the Journal and Bulletin of the Nepal Geological Society which provides a forum for the wider dissemination of the results of the geological studies of the country including the works carried out by the Department of Mines and Geology. I assure you that the Department will continue to provide necessary support to the Society and to work with it in mutual cooperation. Here, I am immensely pleased to know that the United Nations has awarded to the Society the 1998 Meriteous Certificate for Disaster Prevention in recognition of the contribution done by the Society to the development and propagation of IDNDR ideals in Nepal. Indeed, the Nepal Geological Society has done a great job in raising awareness on mitigation possibilities against natural disaster. I congratulate the Nepal Geological Society for a consistent and commendable work. I am sure that the work done by the society has not only helped the country in its efforts towards enhancing capabilities for a better management of natural disaster, but has also put Nepal in the global map of IDNDR success stories.

The IDNDR is coming to an end this year. But we still have to do much to safeguard the Nepalese from the onslaught of natural hazards. The country still has to improve its policy by building and enacting additional regulations, we still have to work towards raising awareness and bring the message to the villages and communities of the country. We still have to conduct researches and integrate the fruits of science and technology in our development projects for ensuring safe environment, we have to train our professionals and technicians. There is still much to do. Therefore, I urge the Nepal geological Society, to continue mobilising its efforts even after the closure of the IDNDR. The Department will work hand in hand with you in your new endeavors.

I do hope that the seminar to follow this inaugural session will help disseminate the results of the scientific works carried out by individuals and institutions. I do hope that such sharing of knowledge will ultimately help the country towards better management of the disaster risks.

I wish you all the successes.

Vote of thanks by U. B. Shrestha, Secretary, NGS

Respected Chairman,
Honorable Chief Guest,
Your Excellencies,
Respected Senior Government Officials of
HMG/Nepal,
Distinguished Guests and Participants,
Dear Fellow Members of the Society,
Ladies and Gentlemen,

On behalf of Nepal Geological Society I am privileged to extend my sincere gratitude to all the distinguished guests and the participants of this one day National Meeting cum Seminar on "Prevention Pays".

I extend my profound gratitude to Hon P.B. Khadka, Home Minister, Ministry of Home and the Chairman, IDNDR National Committee, Nepal for his message to the society in this occasion. The Nepal Geological Society has always received strong cooperation and support from the IDNDR National Committee, Nepal to observe this IDNDR-Day. The Society extends its sincere thanks to the IDNDR National Committee, Nepal, for their kind supports and cooperation to organise today's programme.

I also extend sincere gratitude to our Chief Guest, Mr P. B. Malla, Honorary Member, NGS, for the inauguration of this programme. The society also would like to express its deep gratitude to Mr Padam Prasad Pokharel, Secretary, Ministry of Home, for chairing this inaugural session despite his very busy schedule. The speech is highly appreciable in the context of awareness raising in prevention and mitigation of the natural disaster.

The Society would like to extend its sincere gratitude to Your Excellency Ms. Sarasoti Menon, Deputy Resident Representative, UNDP/Nepal for marvelous address and handing over the 1998 UN Sasakawa Disaster Prevention Award to Nepal Geological Society. The society is highly delighted for this prestigious award. We are highly obliged to UN Humanitarian and Emergency Relief Coordination Office of IDNDR Geneva, Switzerland. We further extend our sincere thanks to UNDP/Nepal for providing financial help in organisation of today's programme.

I would like to extend my sincere thanks to Mr Mohan Bahadur Karki, Joint Secretary, Ministry of Science and Technology for the

important message. The society highly appreciates the Ministry of Science and Technology for its continued cooperation, support and guidance. And hope that this will be continued in future also.

The Society is very grateful to Mr Nanda Ram Sthapit, Directorate General of the Dept. of Mines and Geology for his informative speech. Dept. Mines and Geology has always been supporting the society by providing all kinds of helps at the time of the society's necessity. The society would like to express sincere appreciation and acknowledgment to the Dept. of Mines and Geology.

I also offer my sincere thanks to Mr Koji Kamee, the chief advisor, Disaster Mitigation Support Programme Project (DMSP) for important speech and Financial Support. We further extend our sincere thanks to DPTC for its strong cooperation and support in all the activities of Nepal Geological society.

I am also thankful to National Society for Earthquake Technology (NSET) Nepal for its collaboration and necessary helps it has provided in organising today's programme.

I also extend my hearty thanks to Lutheran World Federation (LWF) Nepal for its collaboration and financial Help in organising today's programme.

The Nepal Geological Society would also like to extend its sincere gratitude to all the high officials of His Majesty's Government of Nepal, Distinguished Guests, NTV personnel, and Journalists for being with us in this ceremony.

I also offer my sincere thanks to various government agencies, national and international agencies, consulting firms/business groups as well as individuals for their kind support and cooperation in all activities of the Society.

Great deal of thanks to all the members of the Nepal Geological Society for their continued cooperation and support in organising today's programme.

Our sincere thanks are also due to the Russian Centre of Science and Culture for providing this venue for today's meeting.

We offer our sincere apologies for inconveniences that may have arisen during the programme.

Once again thank you, thank you all !

Abstracts of the papers presented in the Technical Sessions of the Seminar on Natural Disaster Prevention in Nepal

A Perspective of Disaster Management in Nepal : Scope and Limitations

Meen B. Poudyal Chhetri

*Ministry of Home Affairs
Singha Durbar, Kathmandu.*

Rugged and fragile geophysical structure, very high peaks, high angle of slopes, complex geology, variable climatic conditions, active tectonic processes, unplanned settlement, increasing population, weak economic condition and low literacy rate have made Nepal vulnerable to various types of natural disasters. Apart from these, the lack of coordination among agencies related to disaster management, no clear-cut job description of those agencies, resource constraint, the lack of technical manpower, absence of modern technology, the lack of public awareness, very remote, rural and difficult geo-physical situation of the country, absence of modern technology and so on are other factors that have been found as the major obstacles to cope with the natural disasters in Nepal.

In view of the above situation, formulation of a Disaster Management Regulation and amendment in the existing Act is needed to define the job and responsibilities of the agencies related to disaster management. Well trained technical manpower, advanced technology and sufficient means and resources are also needed to reduce the disaster.

Despite the above problems and limitations, Nepal is gradually picking up the momentum towards improving the disaster management situation. Moreover, policy makers have shown interest to look into the problems of disaster management from the point of view of economic development which is gaining speed in the country.

Above all, the concept of International Decade for Natural Disaster Reduction (IDNDR) has been instrumental in transferring the emphasis from relief and rescue to preparedness and prevention. Various agencies of His

Majesty's Government of Nepal are involved in disaster prevention and mitigation works in close cooperation with various international agencies such as : Japan International Cooperation Agency (JICA), Asian Disaster Reduction Centre (ADRC), Asian Disaster Preparedness Centre (ADPC), United Nations Development Programme (UNDP), International Centre for Integrated Mountain Development (ICIMOD), International Red Cross Society (IRCS), United States Agency for International Development Mission to Nepal (USAIDMN), United Mission to Nepal (UMN), Cooperation for American Relief Everywhere (CARE), World Food Programme (WFP), Save the Children Fund (SCF), Technical Cooperation of the Federal Republic of Germany (GTZ), Lutheran World Service (LWS) etc.. Besides, professional and non-governmental organisations of Nepal are also providing highly valuable support at the time of disasters.

1. Definition

The Natural Disaster Relief Act, 1982 AD includes earthquake, fire, storm, flood, landslide, heavy rain, drought, famine, epidemic and other similar natural calamities as natural disasters. It also incorporates the industrial accident or accident caused by explosions of poisoning and any other kinds of natural disasters.

Natural Disaster Relief Work means any relief work to be carried out in the affected area or likely to be affected by the natural disaster in order to reduce the sufferings and inconvenience caused to the people, to rehabilitate the victims of the natural disaster, to protect life and property of the people, to control and prevent the natural disaster.

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2. Legislation

His Majesty's Government of Nepal has Natural Disaster Relief Act (NDRA) 1982 AD which is amended twice in 1989 AD and 1992 AD before the advent of NDRA, 1982 there was no well-structured disaster policy. Prior to 1982 AD relief and rescue works were carried out on an ad hoc basis, mainly as a social service.

3. Regulation and Procedure

In Nepal, all the pre and post disaster activities are being carried out as the provisions made in the Natural Disaster Relief Act, 1982. The Ministry of Home Affairs is the apex body in relation to disaster management in Nepal. Formulation of national policy and its implementation, preparedness and mitigation of disaster, immediate rescue and relief works, data collection and dissemination, mobilisation of funds and resources are the vital functions of the Ministry. It has its network throughout the country to cope with the natural disasters. There are 75 administrative districts in the country and in each district there is the Chief District Officer as administrative officer who also acts as the crisis manager in the time of disaster. Thus, the

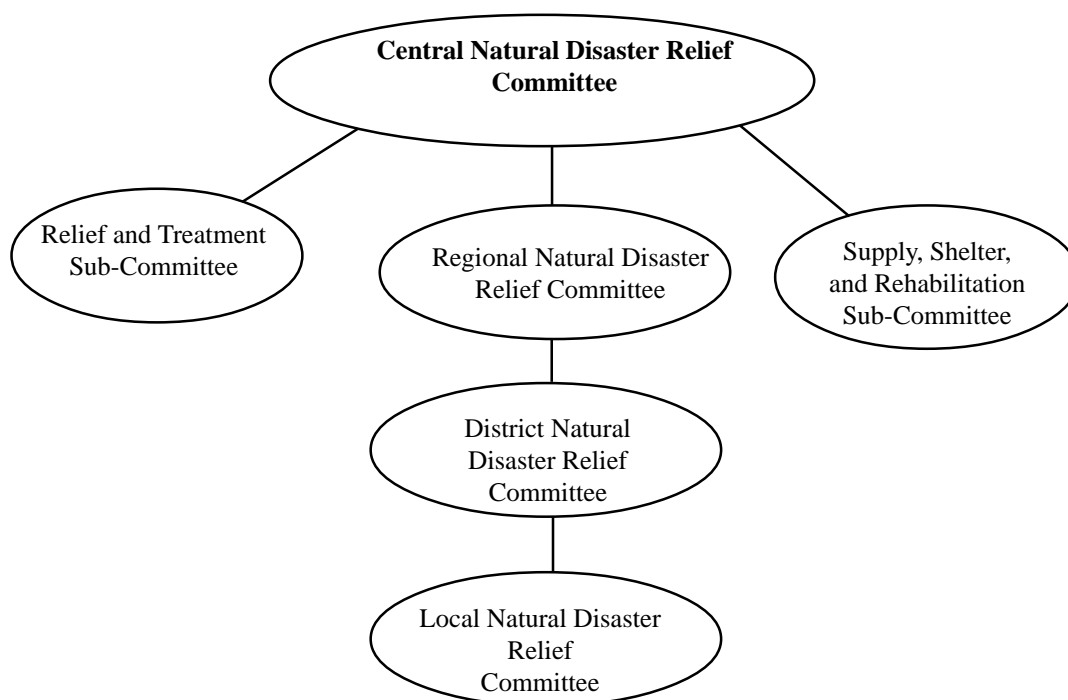
Ministry of Home Affairs is the key agency for immediate response during disasters and has to play a leading role in managing the natural disasters in the country. There is a separate section i.e. Disaster Relief Section within the Ministry of Home Affairs to look after all the disaster management-related affairs.

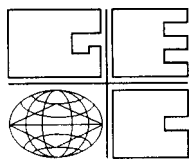
Despite very limited funds and resources, the Ministry of Home Affairs is continuing to mitigate the natural disasters in all respects, though there are a number of problems in disaster management and enough room for the improvement.

4. Organisation

Natural Disaster Relief Act (NDRA), 1982 has the provision to constitute the following organisational structure through which the various activities of disaster management are being carried out effectively and efficiently.

According to the NDRA 1982, Central Natural Disaster Relief Committee (CNDRC) has been constituted under the Chairmanship of the Home Minister in order to formulate and implement the policies and programmes relating to the natural disaster relief work and to





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undertake other necessary measures related thereof. Moreover, the Central Committee prepares specific norms of relief assistance to be distributed to the disaster victims of the affected area in cash and/or in kind. There is also the provision of the Regional Natural Disaster Relief Committee, District Natural Disaster Relief Committee and Local Natural Disaster Relief Committee in order to undertake the natural disaster relief works immediately on the spot. Thus, the Central Committee functions as a central agency and District Committees function as the field agency. The Central Committee provides immediate relief assistance to the disaster victims through the District Natural Disaster Relief Committee. The rescue operations and relief assistance are being carried out and provided basically by the District Natural Disaster Relief Committee in close cooperation with other disaster management-related agencies and various other actors in the district.

The Central Committee may constitute Relief and Treatment Sub-Committee (RTSC) and Supply, Shelter, and Rehabilitation Sub-Committee (SSRSC) which provide necessary advice and suggestions to the Central Committee, help to execute policies and directives of the Central Committee and operate effectively the rescue, relief, and rehabilitation works during very severe natural disasters.

The Central Natural Disaster Relief Committee and the District Natural Disaster Relief Committee also mobilise the army and the police personnel as and when necessary in search and rescue operations.

5. Equipment/Appliances

Nepal lacks modern equipment and appliances to control and reduce the impact of the natural disasters. Early warning system is in a way non-existent in Nepal except in weather forecasting. For an effective early warning system, it is needed to develop a scientific detection system to monitor changes in the physical environment. The system of hazard mapping, vulnerability assessment, and risk analysis has to be developed as all these sectors are still at primitive stage in Nepal.

6. Finances

Provision of a Central Natural Disaster Aid Fund has been made under the control of the Central Natural Disaster Relief Committee. The fund consists of: (a) cash and kind provided by His Majesty's Government of Nepal, (b) fund received from the Prime Minister Aid Fund, and (c) cash and kind assistance received from foreign countries, nationals, foreign agencies, and from other sources. In addition, provision has also been made of the Regional Natural Disaster Aid fund, the District Natural Disaster Aid Fund, and the Local Natural Disaster Aid Fund. These funds consist of the cash and kind provided by His Majesty's Government, the cash and kind received from Central Natural Disaster Aid Fund and from other sources. Whatsoever, at present, only the Prime Minister Aid Fund, the Central Natural Disaster Aid Fund, and the District Natural Disaster Aid Fund are into operation. The budget to the District Natural Disaster Aid Fund is being released from the Central Fund according to the need and justification for immediate relief assistance to the victims of the natural disasters.

For the fiscal year 1999/2000, His Majesty's Government of Nepal has allocated Nepalese Rupees 25 million for the immediate rescue and relief operations.

7. Involvement of NGOs and INGOs

The history of non-governmental organisations in Nepal is quite young. However some inter-governmental agencies like Nepal Red Cross Society carry out remarkable rescue and relief operations during the time of natural disasters. Nepal Scout and very few other non-governmental and social organisations also involve themselves to carry out relief and rescue operations in the time of disaster. Some non-governmental organisations like: CARE Nepal, United Nations Development Programme (UNDP), Lutheran World Federation (LWF), National Society for Earthquake Technology Nepal (N-SET) and Nepal Geological Society (NGS) are being involved in carrying out research, training, and river control activities.

8. Conclusion

Various problems such as difficult and undeveloped physical infrastructure, mass

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poverty, fatalistic nature of some people, poor public awareness, low literacy rate, lack of political commitment etc have made the disaster situation more complex in Nepal. In view of the complexities and diversities of the disaster management a concrete, effective and practicable policy is needed for which political commitment and a pragmatic policy formulation is very necessary. It is also believed that lack of coordination, insufficient fund and resources, and their mobilisation problems have to be addressed

through the effective implementation of the practicable policy. In addition, disaster mitigation, early warning, emergency rescue and relief operation, rehabilitation and recovery plans should involve in activities such as: training, post-disaster evaluation, monitoring of relief works, review, cooperation and coordination of Central, District and Local preparedness, and research etc Recovery planning should involve in long-term as well as immediate recovery programmes.

Amplification of Earthquake Ground Motion in Kathmandu Basin

M. R. Pandey

*National Seismological Centre,
Department of Mines and Geology, Lainchour, Kathmandu*

The Kathmandu Valley, like many others intermontane basins filled with unconsolidated sediments, experiences an intense soil amplification of earthquake ground motion in different parts of the valley. The effect of 1934 earthquake in the valley imprinted as "Intensity Distribution" somewhat reflects the ground amplification. However one has to keep in mind the insufficiency of structural types of building defining the earthquake intensity in 1934. A preliminary projection on earthquake scenario was prepared by NSET based on the imprint of 1934 earthquake in the valley.

The main factors contributing to ground amplifications are: buried bedrock topography, shear wave velocity of unconsolidated sediment, shear zones (fracture zones) in bedrock etc. From simple comparison of bedrock contour map

derived from geophysical observation and the 1934 intensity distribution, one could argue the reported high IX - X intensities to be confined to buried bedrock depressions.

The amplification due to shear wave velocity is estimated from the comparison of microtremor data and one dimension model curve for SH wave buildup. This is specially applicable to frequency band of 1 to 5 Hz. The Chhauni - Humat Pakha area characterised by 200 m sediment of lacustrine clay underlain by 250 m of fluvial sandy sediment has a RMS amplification of 6 to 7 with a sharp peak near 2 Hz. The Gaushala - Koteswor area characterised by delta deposit and part of the lacustrine sediment domain has a 3 - 5 RMS amplification. In general a RMS amplification of 2 is recommended for most part of the valley.

Earthquake Disaster and Hospital Preparedness

Ram Prasad Shrestha

Medicare National Hospital and Bir Hospital, Kathmandu

Earthquake is a sudden, sometimes violent movement of the earth's surface from the release of energy in the earth's crust. It is a catastrophic natural disaster, which causes variable casualties of lives and variable property damage. Nepal has experienced a number of earthquakes, the most

dreadful being that of 1934. Next earthquake of similar or higher magnitude may occur any time about which one cannot predict exactly. In such situation, estimated death would be about 40,000 and injuries 95,000.

Hospital being the key centre for the mass

casualties management system, has to have a well thought disaster response management plan, in the situation of any mass casualties. The plan should be aimed at minimising loss of life and disabilities. Retrospective analysis of Mexico and Armenia Earthquakes illustrate the magnitude and complexity of casualties and their management. Key questions, which a hospital should answer in relation to its preparedness to a disaster, are:

- ◆ Whether the hospital is organised for a disaster situation;
- ◆ Do hospitals have a disaster preparedness plan?;
- ◆ What are the contingency provisions?;
- ◆ Are staff familiar with the hospital disaster plan?;
- ◆ What is the level of motivation?;
- ◆ Do the hospitals perform drills?; and
- ◆ Adequacy of medical supplies during the disaster.

Thus in a disaster plan following components are to be undertaken:

- ◆ Disaster committee formation;
- ◆ Internal mobilisation of personnel, resources and support services;
- ◆ Case receiving and flow pattern;
- ◆ Triage & category tagging;
- ◆ Managing of a disaster ward;
- ◆ Administrative support ;
- ◆ Inter institutional coordination and link with field;
- ◆ Morgue for deceased;
- ◆ Drill / Mock exercise;
- ◆ Site disaster activity with search and rescue; and
- ◆ Retrospective analysis of each disaster situation.

Disaster may not strike twice in the identical way but the lesson from one situation can be applied to another situation and achieve better result in minimising the loss of life and disabilities.

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Bimala Rijal

*Disaster Preparedness Programme
LWF/WS-Nepal*

LWF/Nepal is celebrating International Decade for Natural Disaster Reduction IDNDR Day jointly with Nepal Geological Society HMG Ministry of Home and UNDP, Nepal every year.

As we approach the twenty-first century, population growth, ecological damage, rapid industrialisation and socio-economic imbalances make the risk of major disaster around the world higher than ever. To make people aware of how much they can do to make themselves safer from natural disasters, the United Nations launched the International Decade for Natural Disaster Reduction (IDNDR, 1990-2000).

As you might be aware, the UN Resolution 44/236 of 22 December 1989 has declared 1990s as the IDNDR. In pursuance with this declaration, Nepal formed a National Committee on IDNDR chaired by the Hon. Home Minister in 1990.

The impact of natural disasters is on the rise. Death, injury, and economic ruin caused by disasters are avoidable. Countries should make natural disaster reduction part of their development plans, otherwise, progress in social and economic development will continue to be eroded by recurring disasters. As we know, 'Prevention is better than relief.' Nepal is a disaster-prone country with a population, which

is very vulnerable due to a combination of a high incidence of hazards, widespread poverty and a lack of national infrastructure.

LWF/Nepal is celebrating the IDNDR day not only for the celebration but also for day to day support in the field of natural disaster reduction through different activities, e.g. school earthquake management and safety awareness training to school teachers, Earthquake Awareness Street Drama in the public and schools, publication of disaster related materials like poster, leaflet, sticker etc, and to celebrate National Earthquake Day has been implementing the disaster preparedness Project/ Programme.

LWF/Nepal has been implementing mainly Community Based Disaster Preparedness (CBDP) training for the disadvantaged people in own working area and to collaborate with other partner INGO/NGO in local community level. SEAT programme launched by LWF/Nepal Disaster Preparedness Project in Kathmandu Valley. Many organisations are involved for reduction and preparedness of disaster in Kathmandu Valley (e.g. National Society for Earthquake Technology, KVERMP, UMN, Disaster Management Department of Kathmandu Metropolitan City etc).



LWF/Nepal Disaster Preparedness Programme has been networking as a member of DPNet forum about disaster reduction, preparedness and sharing the information, data, resources among the 14 members agencies. DPNet forum advocacy about disaster management within the grass-root level people and government level.

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Seismic Vulnerability Assessment and Retrofit Design for School Buildings in Kathmandu Valley

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The Kathmandu Valley has been impacted in the past by several catastrophic earthquakes. Study of the earthquake catalog indicates that indicates that a devastating earthquake is inevitable in the long term and likely in the near future.

Knowledge gained in schools gets easily spread to the households and to the parents also. When schools are closed because of earthquake damage, education is delayed and community life disrupted. School buildings are used as temporary shelters, medical posts and relief centres after a large earthquake. Schools play a vital role in every community. Therefore, earthquake-threatened communities need earthquake-resistant schools.

The Udaypur Earthquake of 1988 showed that schools are specifically vulnerable in Nepal: more than 6000 school buildings required reconstruction after the earthquake. Therefore, increasing safety of schools was emphasised in the Kathmandu Valley Earthquake Risk Management Project (KVERMP), which is being implemented since September 1997 by the National Society for Earthquake Technology-Nepal (NSET-Nepal) and GeoHazards International (GHI) as a part of the Asian Urban Disaster Mitigation Programme (AUDMP) of the Asian Disaster Preparedness Centre (ADPC) with core funding from OFDA/USAID. School Earthquake Safety (SES) is one of the components of KVERMP.

The objectives of SES are 1) awareness raising, and 2) enhancement of seismic safety of public school buildings of the Valley. A School Earthquake Safety Advisory Committee, with the Regional Education Director, Central Region, as the Chairman and representatives of the district education offices, municipalities, experts, INGOs etc. provides advice and overview.

SES methodology included inventory of 642 public schools, and conduction of a survey

of the school buildings involving the school headmasters to know the situation of the existing building stock and develop retrofiting solutions which are economically feasible, technically possible, socially acceptable. An illustrative and simplified survey questionnaire was developed that included age of construction, number of stories, structural system, configuration, basic construction material for walls, floor and roof; openings, and existing earthquake resistance features in the school buildings. The questionnaire was subject to review by international expert, and tested in a pilot seminar for school headmasters, which helped to modify it further. A series of 15 one-day seminars, each attended by 25 to 40 school headmasters and members of the management committee, and authorities from the district and regional education offices, were conducted subsequently. The seminars aimed at raising awareness as well as instructing the headmasters to conduct the survey for their school buildings using the questionnaire format.

Out of 643 public schools, only 443 participated in the seminars. Of these 206 responded with filled up questionnaires. An additional 222 schools were visited by technicians for completing the questionnaire entries that happened to be difficult for the school headmasters. An structural engineer field verified the survey formats of 34 (9%) schools.

A computer programme was developed to create the school database for data analysis. As per the analysis there are 909 buildings in the 378 schools. Out of these data is available for 894 blocks, rest are either incomplete, rented out or not usable. Of these 894, 199 buildings were constructed under the Earthquake Affected Areas Reconstruction and Rehabilitation Project (EAARRP) during 1992-1997, and the rest (695 buildings) are normally constructed buildings. Out of 695 buildings, 621 are in load bearing

system and rest 74 are reinforced concrete frame buildings. Out of 621 buildings, the walling material of 34 buildings is adobe, 114 buildings is rubble stone in mud mortar, 281 buildings is rectangular blocks (brick, dressed-stone) in mud mortar, and rest 192 buildings are constructed with rectangular blocks in cement sand mortar. Interestingly, out of 621 masonry buildings only four constitute seismic strengthening measures. As no established methods are presently available for the vulnerability assessment of these building types, effort was made to develop a method that could meet our requirements for vulnerability assessment, which aimed to develop economically feasible, technically possible, socially acceptable retrofitting solutions for the school buildings and to estimate the associated costs for retrofitting. Four methods, notably, i) analytical method, ii) rating method, iii) method based on comparison with codal provisions and iv) MSK intensity method (based on walling materials and definition of MSK intensity scale) were developed.

Although the Rating Method could be the best for the assessment for group of the buildings, time and resource constraints did not allow the required research for determining the applicable scores and relative weight of the various factors affecting the vulnerability. Testing for compliance with codal provision resulted in all buildings to be considered unsafe; however, this result could not give any lead to the likely losses. Therefore, the MSK intensity method was used for vulnerability assessment. The analytical method helped to develop an overall pattern of damage, and this method is

used for the detailed analysis of individual masonry buildings constructed with rectangular blocks such as brick and concrete blocks or framed buildings.

According to the analysis conducted using the MSK intensity method, the economic loss of surveyed masonry buildings varies from 55% to 90%, depending upon the walling material and the number of stories.

Based on the analysis, the building stock has been classified into five groups according to the vertical load bearing system and walling material. Each of the five groups has been further classified into sub-groups depending on the floor and roof structural system and materials, and the number of stories. This led to the identification of different conceptual retrofitting schemes for each sub-group of building. The schemes were weighted against their suitability and ease in construction. The most suitable ones have been selected and designed. It is found that 100 buildings are too weak to be strengthened and need total reconstruction.

The philosophy adopted for retrofitting the school buildings considers i) achieving fail-safe damage: delayed collapse allowing pupils to escape, and ii) achieving reduction in likely damage allowing repair and re-strengthening, at nominal cost, during the reconstruction phase following a damaging earthquake. Retrofitting schemes are proposed only for those groups of building for which the retrofitting cost does not go beyond 25% of the present value of the building, and which will have, after retrofitting, an economic loss of less than 50% in MSK intensity IX.

Chisapani Community Development and Disaster Management

Bishnu Das Shrestha

Department of Soil Conservation & Watershed Management

Ms. Yuka Makino, Japan International Cooperation Agency

In 1996, HMG/Nepal requested the Government of Japan for technical assistance for the surveying the 1993 severely affected areas of the Makwanpur, Sindhuli, and Dhading Districts. The Development Study entitled 'The Study on the Disaster Prevention Plan for Severely Affected Areas by 1993 Disaster in the Central Development Region of Nepal' was completed in March 1997.

Based on the report, HMG/Nepal requested the Government of Japan to implement a programme entitled, 'Chisapani Community Development and Disaster Prevention Programme' (CCDDPP) in Agra VDC of the Makwanpur District. The two and a half year programme began in March. Due to the integrated nature of the CCDDPP programme, the executing agency is the Department of Soil Conservation and Watershed Management (DSCWM) under the Ministry of Forests and Soil Conservation. The implementing agency is the NGO, Nepal Red Cross Society (NRCS).

A four day Logical Framework Workshop, where all the concerned partners and local people took part, was conducted to determine the purpose, goal and implementing strategy of the programme. The purpose of the programme was the reduction of water induced disasters to ensure a safer livelihood and the reduction of poverty of the people of the Chisapani village. The idea was to develop a model village of community-based disaster management through capacity building of the Chisapani community on disaster management, natural resource management and the improvement of socio-economic conditions. The outputs include: (1) increase in the income level of the community; (2) development and implementation of a disaster management system; (3) implementation of community development activities; (4) construction of physical infrastructures for the prevention of landslides; and (5) institutionalisation of disaster management and community development process.

Landslide Hazard Assessment at 19 Km Model Site of Kathmandu-Trishuli Road

Prakash Man Shrestha

Water Induced Disaster Prevention Technical Centre (DPTC)

Pulchowk, Lalitpur

Established on October 7, 1991, one of the objectives of DPTC is to develop the appropriate technology and perform research on water induced disaster in Nepal through Model Site Development and Monitoring. The Landslide at Km 19 of the Kathmandu-Trishuli Road is one

of such Model Site of DPTC. This paper briefly explains the monitoring equipment, investigation methods, result of investigation, prevention works, evaluation of prevention works, analysis of investigation etc. used at the Landslide Model Site at Km 19 of the Kathmandu-Trishuli Road.



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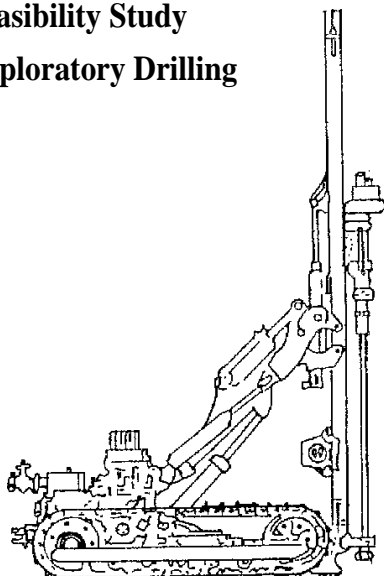
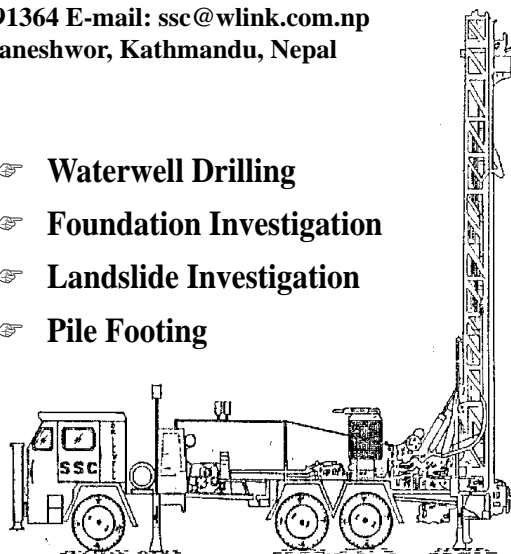
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Bank failure problem along the Seti River, Pokhara

M.R. Dhital

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In Pokhara, the bank failure along the Seti River is one of the major problems. A bridge over the Seti Khola, along the Prithvi Highway, collapsed on the second of September 1991. The bridge was destroyed because of bank failure by extensive cracks developed on the right (western) bank of the river. The bridge formed a part of the Prithvi Highway. Numerous old cracks are also observed between the mouth and outlet of the gorge of the Seti River.

A new bridge (about 120 m long) was constructed along the same route in 1998. But in the monsoon of 1999, a large (about 150-m long) crack was seen on the left (eastern) bank of the Seti River. The crack is at about 25 m east of the left bank. This newly developed crack has become a matter of great concern for the people of Pokhara.

In the vicinity of the Seti Khola, there are three major sediment units: namely the Ghachok Formation, the Pokhara Formation, and the Gravel Veneer. The Ghachok Formation is generally karstified and jointed. Sinkholes and pinnacles are developed in it.

The Ghachok Formation is widely distributed in Pokhara. Most of the area along the Seti Khola is covered by this Formation. At the vertical banks of the Seti River gorge, the Ghachok Formation appears to be an extremely hardened rock-like material. This is due to two effects: one is its very high content of calcareous cement and the other one is the formation of calcareous crusts on its surfaces.

It is composed of angular to sub-rounded gravels, cobbles, and boulders within a light brown calcareous silty matrix. Locally large blocks are also found. The elements are composed mainly of laminated grey limestones, sandstones and shales that are derived from the sedimentary rocks of the Tethys Group of the Annapurna Massif. A small quantity of gneiss, quartzite, and schist is also present. Sorting is

very poor and sedimentary features as bedding planes are nearly absent except for the lower part.

In the lower part of the Ghachok Formation some differences from the main part of the unit are observed. In general, the composition is similar but well-developed bedding planes are present especially in the area south of the failed bridge. Furthermore, some well-rounded cobbles and boulders are found, but most of it is made up of the matrix-supported material, which mostly prevents grain-to-grain contacts.

The upper part of the Ghachok Formation contains cone-shaped pinnacles. A black crust forms their surface. In the depressions between the cones a soft to stiff yellow soil is found which contains gravels, cobbles and even some boulders.

The second widely distributed lithostratigraphic unit of the study area is called the Pokhara Formation. Compared to the sediments of the Ghachok Formation, there are two main differences: (i) grain size is considerably smaller; boulders have not been observed; and (ii) the degree of cementation is much lower. The mineral composition and the poor rounding and sorting, however, are quite similar.

A layer of conglomerates called the Gravel Veneer unconfirmably overlies the Ghachok Formation at the bridge site. It consists of rounded to well-rounded gravels, cobbles, and boulders in a sandy matrix. A certain degree of cementation is observed giving rise to the formation of hard pans upon caves below them. The water level in the Seti Khola rises many times every year during heavy rains by 15 to 20 m at the opening (400x700 m²) at Ramghat, which is about 600 m upstream of the collapsed bridge. The water level in the Seti River rose by 10 to 15 m for about an hour at midnight of 1 September 1991, at Ramghat.

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The field investigation on September 3 and 4 revealed that extensive bank failure and toppling is observed between the mouth and outlet of the gorge of the Seti River.

The crack record of the Department of Roads revealed that the on 2 September, the cracks started from the edge of the western bank about 50 m upstream and progressed to the edge of the bank about 120 m downstream. The crack behind the western abutment was 52 m away. The failure pushed the bridge to the east and it resulted in the heaving of the approach pavement, adjacent to the bridge. Failure by fall and toppling occurred subsequent to the initial slip. It resulted in 3 to 5 m wide cracks and diversion of the flow to the new channel behind the west abutment on 5 September 1991, and about 20 m chunk of the

west bank subsided by about 3 m, tilting the bridge by about 6 degrees. No sign of failure was noticed in the eastern bank of the bridge site.

The angle of internal friction was 37 degrees (calculated from the soil sample of the matrix). This fact indicates that the material completely lost its strength parameters at some depth and failed along an inclined plane more or less equal to that of the angle of internal friction. The failure mechanism is related to the saturation of the soil by the groundwater as well as water from the Seti River. After some time, when the material was completely saturated with water, as a result of the fall of the water level in the Seti River, the seepage forces acted upon it, and due to piping, the mass failed making an angle equal to that of internal friction.

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ARTICLES (लेखहरू)

Mines and Environment: Present Status and Issues in Nepal

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1. BACKGROUND

Formation of various rock types and minerals under different geo-physico-chemical conditions and depositions of different types of minerals, fossil fuels etc took place during the geological past. As soon as the formation of soil and water took place on the surface of the earth, various types of plants as well as animals appeared. By the process of evolution from a unicellular micro-organism to human beings it took over 500 million years. Early Homo Sapiens (early human beings) came into existence in the earth only about 0.5 million years ago. Since the time of Stone Age, human beings are making use of all types of natural resources. By the time of Iron and Bronze Age, they started exploiting various types of natural resources like minerals, water, land and plants, and making multiple use of them for their benefit and comfort. Nowadays, rocks and minerals are not only used as construction materials, decorative stones, ornaments, industrial/ chemical raw materials, sources of various types of metals, precious stones and fossil fuels (petroleum, natural gas, and coal) but also used for nuclear energy, optical and electronic appliances, chemical and modern medicines. At present these mineral commodities are becoming the essential parts of the modern life. Therefore, to fulfill the present public demand, all these natural resources are so much exploited and used that they are creating the adverse effects in the natural environment.

All the mining and development activities take place on the earth. Our ultimate resources also come from the earth and people are exploiting these resources for the betterment of their life. Together with uncontrolled population growth the demand of these commodities is increasing. To fulfill the demand, unplanned and haphazard mining and exploitation practices of these mineral commodities has increased significantly causing global environmental

pollutions since the beginning of 20th century. This burning environmental problem came to realise by the people only since last 2-3 decade. In addition to haphazard and uncontrolled mining, other major causes of environmental degradation are unplanned urbanisation, improper development activities, industrialisation, uncontrolled land use, haphazard disposal of all kinds of waste, exploitation of natural resources etc. All these causing, air, water and ground pollution and ultimately bringing the problem of health hazards. Now, it became a global problem. The people realise that it is their responsibility to carry out sustainable development activities, preserve natural environment, keep the ecological balance and maintain the friendly ecosystem.

2. ENVIRONMENTAL DEGRADATION AND POLLUTION

Every country has environmental problem but the spectrum of the problem is different. The environmental degradation in the industrialised nation is largely chemical. They are responsible for the bulk of the emission that causes greenhouse effect. On the other hand the environmental degradation in the developing countries is largely physical such as mining, agriculture, urban and infrastructure development, industrialisation, hydroelectric schemes, waste disposal etc. have some impacts on environment. At local/regional level the pollution takes place through particulate and gaseous emissions of SO_2 , NO_2 , CO_2 which may be transported through stratospheric winds, causing acid rain. Similarly, at global level, pollution takes place by burning of fossil fuels which increases the carbon dioxide content and bring about global warming or what is generally known as the Greenhouse effect. As a result, climatic changes are taking place. Chloro-fluorocarbons (CFCs) destroy the ozone layer in the

stratosphere. To discuss about the global environmental problems in international forum an international conference on Mining and Environment was held in Berlin in 1991 and in India in 1995. In these meetings environmental problems and issues were identified. A high level International conference was also held in Rio-De-Zenerio in 1992 and many Heads of States and Heads of the Governments took part in it. In these meetings, all of them agreed upon and determined to solve these global issues of environmental degradation. But the problems still remain unsolved.

3. MINING HAZARD, POLLUTION, AND ISSUES IN NEPAL

A number of historical small-scale iron, copper, lead, zinc, cobalt, nickel, gemstones, and other industrial minerals and construction material mines and quarries are known in Nepal. Most of them were operational before 1950 without proper environmental geological assessment. Only after the establishment of Nepal Bureau of Mines in 1961 and Nepal Geological Survey in 1967, (presently as Department of Mines and Geology), systematic geological study was initiated in the mineral resources development in Nepal. Since then, Department of Mines and Geology (DMG) has already identified a number of large, medium to small size economic and sub-economic mineral deposits like, Godavari marble, Chovar limestone, Bhainse limestone, Okhare limestone, Sindhali limestone, Jogimara limestone, Chalkute limestone, Narapani limestone, Dhankuta limestone, Salyan limestone, Khari Dhunga magnesite and talc, Ganesh Himal lead - zinc, Phulchoki iron, and quite a few other small copper, lead, zinc, gemstone, coal, limestone, and construction materials in different parts of the country. Based on some of these economic mineral deposits a few mines are in operation as the source of raw materials for marble, cement, deadburnt magnesite (DBM), talc, lead and zinc, coal, and construction materials. Mineral industries like cement factories, brick factories, stone crushing plants, agri-lime industry, DBM plant and all the quarries produce smoke and dust, which are the chief causes of air pollution.

It is a known fact that exploitation and mining of mineral resources create multitude of

effects on natural environment of the entire area and disturb the eco-system. Environmental impacts could be of various magnitude and significance if, mining is unscientific and haphazard. Mining activities (specially open cast mines/ quarries) bring the visible changes in the landscape such as deforestation, change in natural slope, soil erosion, landslides, subsidence and lowering of ground water table and ultimately causes air, water and ground pollution in the region. In this case, open-cast mining is of more concern to the public rather than under ground mining.

In Nepal, almost all the operating mines/ quarries are open-cast mines except few small-scale coal and copper mining activities. The mineral industries (as mentioned above) damage the natural landscape, accelerate deforestation, and make negative impacts on fauna, flora, and aesthetic values of the area. Similarly, improper and haphazard mining and exploitation of the construction materials including sand/gravel mining from the riverbed are causing damage to the infrastructure (houses, bridges, dams etc) in the mining area. Haphazard disposal of mining waste and industrial effluents also create the problem of air, water, and ground pollution, which directly or indirectly affect the health of the people around.

Particulate (dust) is one of the major pollutants in the air. Quarry operation, drilling, sawing, blasting, crushing plants, vehicular emission from the movements of heavy vehicles in the quarry sites, and smoke from the chimneys of the industries are the main sources of dust, smoke, and gaseous emissions which causes **air pollution**.

Noise pollution is mainly due to operation of compressors, drilling, sawing, blasting, and crushing unit, grinding and processing units in the industry, movement of working vehicles, and unnecessary blowing horns.

Water pollution takes place due to haphazard dumping of mining and mineral waste, sediment coming with the rainwater from the quarry/ mine site, crushing/ cutting, and polishing units. In the factory, water is commonly used for washing, cleaning, cooling, sawing, polishing etc. As a result, water gets contaminated with various chemicals as well as sludge and other

effluents from the factory. Improper and haphazard dumping of all types of industrial waste could also contaminate groundwater.

4. PRECATUTIONARY MEASURES

Soil erosion and landslides can be reduced by afforestation and rehabilitation of the exhausted mine areas. Application of bioengineering techniques, construction of physical structures like gabion walls, check dams, stone barriers etc also help to control soil erosion and trap the sediments. Sediment impounding structures and tailing dams with proper drainage system could also control silt and sediments to protect river water pollution.

Mining activities such as blasting creates ground vibration, fly rocks, dust and resulting cracks in the houses and engineering structures and air as well as noise pollution. Now a days, to minimise blasting hazard shot exploders and low charge of explosives are practiced. Similarly use of diamond wire saw can also help to reduce drilling noise and blasting hazard considerably as it is done in Godavari marble quarry/ Industry. Proper dumping of mining and mineral waste in suitable place can help to reduce the air/ water pollution.

In Nepal, some of the active mines/ quarries and mineral industries are still adopting conventional practices for the extraction of raw materials. Possible pollutants and environmental hazards associated with the operation of mines/ quarries and mineral industries have been identified. Many issues were also raised by the public about environmental degradation due to mining and operation on mineral and other industries. Nowadays, the industries are also conscious about the environmental problem and they are trying to minimise the impact by applying various mining techniques and mitigation measures. However, only a few of them are in operation under the regular supervision of concerned professionals. Top management of Godavari Marble Industry has formulated the environmental planning management policy. According to that policy the industry has adopted environment friendly technology and used various measures to minimise the negative impact on environment. (1) Air/ dust pollution is controlled by water spraying, putting jute covers, cyclone dust

collector and bag filter and dust masks (2) The fly rocks and blast hazard is controlled by shot exploders, low charge of explosives and muffle blasting is adopted to eliminate fly rocks. Similarly diamond wire saw machine is employed where ever is possible to reduce the drilling noise. (3) Noise pollution is reduced by enclosing the compressors and gangs saws, reducing the numbers of blasts and blasting time. Workers use cotton earplug to minimise the damage of hearing capacity. (4) Soil erosion and mudflows are controlled by boulder pitching, construction of gabion weir, check dams and retaining walls. Plantation on the slope has helped a lot to control soil erosion and landslides. Proper disposal of waste in a suitable dumping yard and later use of dumping material into post mining reclamation and rehabilitation helps to control industrial waste. This way Godavari marble quarry and Industry is doing well to minimise the environmental pollution. It follows the environmental guidelines prepared by DMG.

Sand deposits of Kathmandu Valley are terrigenous in origin and mainly derived from the surrounding hills. Previously there were quite a few sand mines in the riverbeds of Bagmati, Bishnumati and Manahara rivers in Kathmandu Valley. As a result, river sand deposits in Kathmandu Valley are nearly exhausted (Sharma, 1996). Extraction of excessive amounts of sand from the riverbeds has created negative environmental consequences like lowering of the river beds, damage of foundation of the bridges (e.g. Manahara Bridge near SanoThimi, Bagmati Bridge in Kopundole), and dams, lowering of ground water table, water impounding and narrowing the river channel and encroachment of the river bed for agriculture and settlement, degradation of aquatic animals, river water pollution and health hazard and also loss of aesthetic beauty etc. Sand deposits of hillocks and older terraces are the alternative sources of sand in Kathmandu Valley. Now a day, such deposits are also being exploited in Thimi, Duwakot, Gokarna and few other places without any environmental geological consideration. Such unscientific mining activities have promoted environmental degradation e.g. erosion, siltation, threats to infrastructure, loss of agriculture land, change in natural drainage system, air/ water pollution, health hazard.

Mining and exploitation of magnesite at Kharidhunga obviously causes environmental impacts like in other open cast mines. Therefore, the mining company has realised the environmental problems and some mitigation measures are taken to minimise the effect. An extensive network of gabion walls and check dams are constructed to control soil erosion, landslide and to trap the sediments to minimise the pollution further down. Tailing dams are constructed to control siltation. Forestation on surrounding inactive areas to control soil erosion. Dust pollution minimised by spraying in the quarry site and road. Proper drainage system is maintained

Similarly mitigative measures are also taken in other limestone quarries like in Bhainse, Okhare limestone quarry and Hetaunda Cement Factory, Makwanpur and Sindhali limestone quarry and Udayapur Cement Factory. However, these measures are not sufficient enough to control environmental problem. It is advised to follow environmental guidelines prepared by Department of Mines and Geology.

Chobhar limestone quarry and Himal Cement Factory as well as over 200 brick kilns/ factories and about a dozen of stone crushing plants are the major pollutant mineral industries in Kathmandu Valley. They do not have any dust control mechanism at all in their factory.

5. ENVIRONMENTAL IMPACTS AND RECOMMENDED MITIGATION MEASURES

Environmental impact is a change in the environmental parameters over a specific period and in a specified geographical area. Environmental mitigation measures are the tools for avoiding or reducing the potential adverse environmental impacts resulting from mining/ development activities carried out by human. Some of the mitigation measures to minimise the environmental degradation in the region are recommended to protect environment from mining activities are as follows.

Air is polluted due to increased level of particulate matters, carbon-di-oxide, carbon-mono-oxide, sulphur-di-oxide, hydrogen sulphide, nitrous oxide and lead (IUCN, 1998) The level has to be reduced considerably. Therefore, adopt best available environmentally friendly technology to control air, water, noise and ground pollution. Environmental Impact Assessment (EIA) must be

carried out for all types of mines/ quarries and industries before and during operation of mines/ quarry.

Open cast mining/ quarrying activities promote air, ground and water pollution. Such quarries must be located far away from the settlement areas, drinking water source/ intakes, historical monuments, cultural heritage, cultivated lands etc. Therefore, at least 1km buffer zone between the settlement area and mine/ quarry site and industrial site should be left for safety. It is recommended to control sliding by constructing appropriate stabilising structures, using bio-engineering techniques, making proper benching and suitable drainage system to discharge storm water, planting trees and protection of forest in the near by areas and rehabilitation of the old quarries.

Chobhar limestone quarry, Himal cement factory, brick factories and stone crushing plants are the main air and water pollutants in Kathmandu Valley. Himal cement factory must have dust and smoke control mechanism. Brick factories must be relocated far from the settlement areas. Stone crushing plants should not be allowed in the valley. All types of mining operation must be systematic and they must follow the environmental guidelines. All the unwanted waste materials must be disposed in identified suitable landfill sites just to avoid pollution.

People are gradually realising that they must live in harmony with the nature. Therefore, environmental awareness programme will help to educate the people about human activities and consequence environmental degradation and health hazard. The role of public participation in the process of environmental protection is very effective.

Control on licensing and regular monitoring and supervision of all mines and mineral industry sectors including their environmental aspects are entrusted to the Department of Mines and Geology/ HMG. To enforce the environmental protection policies of the government some laws, rules and regulations are enacted e.g. (1) The Industrial Enterprises Act 1991, (2) Mines and Minerals Act 1985, (3) Nepal Mines Act 1967, (4) Mineral Regulation 1961, (5) Legal aspects of sand mining guidelines (DMG, published 1998), (6) Newly drafted Mines Regulations 1994. All these existing acts, rules and regulations must be implemented effectively.

Geo-Scientific Inputs and Contribution of Department of Mines and Geology in Selection of Waste Disposal Sites for Some Municipalities

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1. Introduction

Most of the Nepalese municipalities are confronted with fast deterioration of their environment. Haphazard disposal of solid wastes, generally uncontrolled dumping along rivers, roadsides or within forests is one of the main problems causing severe environmental impacts. With the changing way of living style, the simple harmless urban waste has also changed to a more complex and hazardous substances posing more and more threats to the living conditions of the people. Waste disposal is a problem that increasingly demands the attention of scientists, engineers, policy makers and the general public. Therefore, the selection and development of a suitable sanitary landfill is a multi-disciplinary task and requires a series of activities. One of the first steps is the identification of areas with sufficient geological barrier potential to avoid pollution of subsoil and groundwater by leakage originating from disposal of waste. After selection of a suitable location, the design and technical requirements to develop the site have to be planned thoroughly. Preparing the concept for proper management, operation and monitoring is the last step towards an environmentally sound sanitary landfill site.

The Department of Mines and Geology (DMG) under its Environment Geology Project (Nepal-German Cooperation) is currently providing advisory services to different municipalities in selecting appropriate landfill sites for solid waste management. In this context, a Letter of Understanding was signed between the DMG and Urban Development through Local Efforts (UDLE) in September 1, 1999 stipulating the steps of investigation and the modality of cooperation to support five municipalities namely Tansen, Butwal, Bharatpur, Dhangadhi and Banepa. Primary objective of this cooperation was to help municipalities in selection and development of sanitary landfills.

2. Geo-scientific rationale

Ideally a waste disposal site should be located in an area where the permeability of underlying soils is very low and the nature of soils is attenuative of dissolved chemical constituents from migrating pollutants. In other words, soil should be more clayey with high values of Cation Exchange Capacity (CEC). Therefore, any search for landfill site should be focussed on delineation of areas where rocks/ soil with a high retention capacity for pollutants and sufficient thickness (at least 5m) and extension exist in shallow subsurface to act as geological natural barrier. Such barrier is an important part of the overall safety concept for waste disposal and has to be considered as the last protection layer which prevents the infiltration of pollutants into the ground water if the technical barrier (i.e. artificial) fails. Any landfill site in addition to being geo-scientifically suitable should be economically feasible and socially acceptable.

3. Main criteria defining site suitability

In order to ensure that the negative environmental impacts of a landfill are minimised the following criteria should be thoroughly considered:

- low permeability ground (transmissibility $k_f \leq 10^{-7}$ m/s) of at least 5m thickness preferably clay or low permeable bed-rocks
- high Cation Exchange Capacity (CEC) and low percolation rate of the subsoil
- more than 2m distance between level of ground water and bearing surface of the landfill site
- site not located in the drinking water catchment area, well fields, and main groundwater recharge area
- sufficient distance to major drainage (about 200m) and settlements; not located within flood prone areas
- extreme morphology and land slope of over

- 15° should be avoided
- availability of cover material (suitable soil) in the vicinity of the site
- should not be close to the areas of historical cultural and national importance
- areas closer than 3km from airports used by turbo-jet aircraft or 1.5 km from airports used by piston-type aircrafts.

4. Procedure/Methodology

Advisory visits start after the DMG, UDLE or TDF receive a letter of request from the municipality for technical assistance. The cooperation programme includes three main steps as described below. DMG carries out the first two steps of site investigation while the final step of technical design and development of the site will be supported by TDF.

Step 1. Preliminary geological assessment of the sites proposed by the municipality: It consists of 1-2 days field work for rapid evaluation focusing mainly on the presence of geologic barrier potential of the subsoil and general site suitability. If non of the proposed sites appear to be suitable, the search for alternative location should be carried out by the municipality following the guidelines provided by DMG experts.

Step 2. Detailed assessment of barrier potential and soil condition: This investigation is conducted only if the site is passed through the above step. This investigation involves a series field and laboratory tests in addition to topographical survey e. g. auguring, CEC analysis, sieve analysis, engineering parameters etc.

Step 3. Technical design and development of landfill site: Based on the recommendation

of the geological investigation, the related municipality can apply to Town Development Fund (TDF) for investigation grant and TDF will then select a local consultant for design and site development.

At all steps, the municipalities should get involved in the field works and contribute in whatever possible means (local labour , transportation, lodging/fooding for experts or other logistics) to ensure active participation.

5. Current status

DMG has rendered advisory services to all 5 municipalities included in the Letter of Understanding in preliminary assessment of the sites proposed by them. In Tansen, Butwal, and Dhangadhi, detailed field investigations have been completed, while in Bharatpur the proposed site which lies within forest area and is temporarily used by Royal Nepal Army, is under process of securing a permission prior to go for detailed investigation. Recently advisory service of the DMG has been extended to Dhankuta municipality as well on specific request.

DMG's initiatives in this sphere has been particularly successful in imparting knowledge or message to the enlisted municipalities in the sense that they are now aware of the importance of a suitable landfill site and for its selection geo-scientific investigation is a first step towards its development.

It is pertinent to recall here that DMG under the project prepared a map of the Kathmandu Valley showing potential areas for waste disposal selection and also participated in EIA studies for proposed landfill sites namely Syuchatar, Sundarighat and Sanglatar contributing significantly on the geo-scientific aspects.

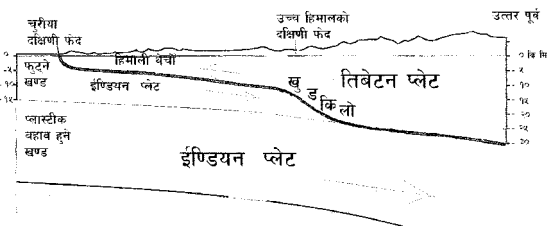
नेपाल हिमालयमा भूकम्पको पूर्व सूचना सम्बन्धी लक्षणहरू

माधव राज पाण्डे
राष्ट्रिय भूकम्प मापन केन्द्र
खानी तथा भूगर्भ विभाग, लैनचौर, काठमाडौं

करिव चार करोड पचास लाख वर्ष पहिले दुई महादेशीय भौगर्भिक प्लेट, इण्डिया र युरेशीया, ठक्कर खाएपछि दक्षिणमा रहेको इण्डियन प्लेट युरेशीयन प्लेटको दक्षिणी भाग “टिबेटन प्लेट” मुनी घुस्दै जाने प्रकृतिको फलस्वरूप हिमालय पर्वत श्रृंखला बन्न पुग्यो । वर्तमान समयमा विश्वभरमै यस्तो खालको एक महादेशीय प्लेट मुनी अर्को घुस्ने भौगर्भिक प्रकृतिको घुसाइ रहेको एक मात्र स्थान हिमालय हो ।

भौगर्भिक प्लेट भन्नाले पृथ्वीको करिव १५० कि.मि. मोटाईको बाहिरी स्थूल भागलाई बुझाउँछ । यो यस भन्दा मुनिको कम घनत्वको तरल प्रकृतिको तहमा तैरिरहेको र निरन्तर एक अर्कातिर हिँडिरहेको हुन्छ । भौगर्भिक प्लेटको सबैभन्दा बाहिरको ३३ देखि ७० कि.मि. सम्म मोटाई भएको तहलाई भूपटल (Crust) भनिन्छ । भूपटलको सबभन्दा माथिको करिव ३० कि.मि. मोटाई भएको भाग स्थूल बस्तु जस्तै फुट्ने (Brittle) प्रकृतिको छ भने त्यस भन्दा मुनिको भागमा प्लास्टिक जस्तै लचकिलो बहाव (Ductile flow) हुन्छ । एक प्लेट अर्को प्लेट मुनि घुस्दा उपरोक्त अनुसारको फुट्ने (Brittle) तथा लचकिलो बहाव (Ductile flow) हुने खण्डहरूमा भिन्नाभिन्ने तरिकाले प्लेट विस्थापित हुन जान्छ । उदाहरण स्वरूप इण्डियन प्लेट उत्तरतिर घुस्ने प्रकृत्यामा तल्लो लचकिलो बहाव हुने खण्ड निरन्तर गतिमा रहि विस्थापित भइरहेको हुन्छ भने सबभन्दा माथिको खण्ड स्थूल, फुट्ने प्रकृतिको भएकोले तिब्बतीय प्लेटबाट अवरुद्ध हुन जान्छ । प्लेटको गति केही समय अवरुद्ध भई संचित भएको शक्ति कुनै अवस्थामा पुगे पछि अकस्मात प्लेटको विस्थापनबाट क्षिण हुन जान्छ । यस्तो प्रकृत्यामा भौगर्भिक दृष्टिकोणले कमजोर सतह (भ्रंस) मा बिपरित खण्डका चानहरू एक अर्का तिर विस्थापित हुन जान्छन् । साधारणतया यस्तो कमजोर सतह दुई प्लेटको सिमानामा पर्ने कन्ट्याक्ट सतह हुने हुदा इण्डियन प्लेट उत्तरतिर घुस्दा तिब्बतको प्लेट दक्षिणतिर विस्थापित भई भ्रंस सतह माथि रहेका चानहरू भ्रंस सतह मुनिका चान माथि खण्टनगई हिमालय पर्वत श्रृंखला श्रृजना हुन गएको छ ।

केही समय इण्डियन प्लेटको गति अवरुद्ध भई संचित शक्ति अकस्मात एकैचोटी प्लेट विस्थापनबाट क्षिण हुने प्रकृत्या नै हिमालयका विनाशकारी भूकम्पहरू हुन् । एक भूकम्प देखि अर्को भूकम्प सम्म हुन जाने अवरुद्ध तथा विस्थापनको श्रृंखलाबद्ध प्रकृत्याको अवधिलाई भूकम्प चक्र भनिन्छ । भूकम्प चक्रको अवधि भन्नु र भूकम्प पुनरावृत्ति समय भन्नु एउटै कुरा हुन जान्छ ।



वास्तवमा भन्ने हो भने भूकम्प चक्रलाई चार चरणमा विभाजन गर्न सकिन्छ ।

- सह-भूकम्प चरण (Coseismic):** यो भूकम्प गडैरहूदाको चरण हो । यो केही सेकेण्डदेखि केही मिनेट अवधिको हुन्छ ।
- उत्तर-भूकम्प चरण (Postseismic):** भूकम्प गएको लगत्तै पछिको केही दिनदेखि केही वर्ष अवधिको हुन्छ ।
- अन्तर-भूकम्प चरण (Interseismic):** यो केही दशकदेखि केही शताब्दिसम्म को अवधिको हुन्छ ।
- पूर्व-भूकम्प चरण (Preseismic):** केही मिनेटदेखि केही वर्षसम्म को भूकम्प जानु लगत्तै अधिको अवस्था हो । अन्तर-भूकम्प तथा पूर्व-भूकम्प चरणमा भूकम्प उत्पादक पद्धतिमा भार बढ्दै जान्छ भने सह-भूकम्प तथा उत्तर-भूकम्प चरणमा भारलाई बिसाउने कार्य हुन्छ । यसरी भूकम्प चक्र भनेको भार लदाउने र बिसाउने प्रकृत्या हो र प्रत्येक चरणमा अझै नै खालका भौतिक तथा भौगर्भिक प्रकृत्याहरू हुन्छन् । यस्ता प्रकृत्याहरू अध्ययन तथा अनुसन्धानको आधारमा समझदारी गरेर मात्र भूकम्प प्रकोपको वैज्ञानिक मूल्याङ्कन तथा पूर्व सूचना विकास गर्न सक्षम भइन्छ । ठूला भूकम्पहरूको भूकम्प चक्र साधारणतया केही शाय वर्षको हुने र भूकम्प विज्ञानको खास विकास भने पछिल्लो ४ दशक यता मात्र भएको हुदा संपूर्ण भूकम्प चक्रको प्रकृत्यागत अवलोकन हिमालयमा वा अन्य कुतै पनि भएको छैन । यद्यपि भूकम्प चक्रका विभिन्न चरणमा रहेका खण्डहरूको अवलोकनलाई मिश्रण (Composite) गरी पूर्ण चक्रको अवधारणा भने तयार पारिएको देखिन्छ ।

हिमालयमा जस्तो भौगर्भिक तथा टेक्टोनिक (भूकृत्याशीलता) अवस्था अन्यत्र कुतै नभएको र साथै वैज्ञानिक अध्ययन अनुसन्धानमा पनि हिमालय धेरै पछि परेको हुदा

भूकम्प उत्पादक संरचनाको पहिचान, भूकम्प चक्रको प्रकृयागत समझदारी इत्यादि विषयमा धेरै उपलब्धि हासिल भएको देखिँदैन ।

खानी तथा भूगर्भ विभाग तथा फ्रान्सको DASE बाट संयुक्त रूपमा विगत २२ वर्षदेखि संचालित हिमालयको सेस्मोलोजिकल तथा भू-भौतिक अध्ययन अनुसन्धान तथा अन्य निकायहरूको अध्ययनबाट नेपाल हिमालयमा सेस्मोटेटोनिक अवधारणाको विकास तथा उपरोक्त अनुसार भूकम्प चक्रको प्रकृयागत अध्ययनको संबन्धमा केही महत्वपूर्ण उपलब्धि हासिल भएका छन् । यी उपलब्धिहरूका मुख्य बुंदाहरू निम्नानुसार छन् :

नेपाल हिमालयमा साना (१ देखि ५ म्याग्नेच्युड सम्मका) तथा मझौला (५ देखि ७ म्याग्नेच्युड सम्मका) भूकम्पकेन्द्र बिन्दुहरूको करिब २०-३० कि.मि. चौडाई भएको सोतो (Belt) उच्च हिमालयको दक्षिणी फेद हुँदै पूर्व नेपालदेखि पश्चिम नेपालसम्म फैलिएको छ । यो यस भेगको भूकम्प जाने प्रकृयाको प्रमुख विशेषता हो । गहराईमा भने यो सोतो मध्य भूपटलमा रहेको इण्डियन प्लेटको खुड्किलोमा निहित भएको देखिन्छ जुन कि १० देखि ३० कि.मि. को गहराईमा पर्दछ । उच्च हिमालयको दक्षिणी फेद मुनि पृथ्वीको गहराईमा इण्डियन प्लेटको खुड्किलो विद्यमान भएको कुरा भौगर्भिक तथा भूभौतिक आँकडाबाट पुष्टि भएको छ । इण्डियन प्लेट उत्तरतिर सर्न खोज्दा उपरोक्त भूकम्प चक्रको अन्तर भूकम्प चरणमा यस खुड्किलोमा दबाव बढ्नगई साना भूकम्पहरू जाने गर्दछन् । ६ देखि ७ म्याग्नेच्युडका मझौला भूकम्पहरू पनि यसै खुड्किलो संरचनामा जाने गर्छन् । सन् १९८० को बर्षाको ६.५ म्याग्नेच्युडको र १९९९ को भारतको चम्पौली भूकम्प यसका उदाहरणहरू हुन् । उपरोक्त साना भूकम्पहरूको मेसो GPS (Global Positioning Setellite) सर्भेबाट यकिन गरिएको जमिन अग्लो हुने उच्चतम दर (प्रति वर्ष ७ मि.मि. सम्म) संग राम्रो मेल खानाले पनि यस अन्तर भूकम्प चरणमा इण्डियन प्लेटको दबाव खुड्किलो संरचनामा पर्न गई भूकम्पहरूको उद्गमस्थल हुने कुरा पुष्टि हुन्छ । त्यस्तै म्याग्नेटोटेलोरिक सर्भेबाट यसै क्षेत्रमा गहराईमा देखिएको बिद्युतिय उच्च संवाहनता (Conductance) ले यस प्रकृया बारे अरु प्रकाश पारेको छ ।

अन्तर-भूकम्प चरणमा उच्च हिमालको दक्षिणी फेददेखि चुरीया पहाडको दक्षिणी फेदसम्म भने इण्डियन प्लेट र तिब्बतीयन प्लेट (हिमाली चानको थेंचो) बीचको करिब करिब समतल सतह भएको भ्रंस सतह (कमजोर सतह) मा भने तनाव बढिरहेको हुन्छ । साधारणतया यसमा कुनै भूकम्प जाने गर्दैन । ८ भन्दा ठूलो महाभूकम्प उच्च हिमालयको दक्षिणी फेदमा सुरुभई दक्षिणमा चुरीयाको फेदसम्म सम्पूर्ण क्षेत्रमा उपरोक्त दुई खण्ड, इण्डियन प्लेट र हिमाली थेंचो, लाई बिपरित दिशातर्फ बिस्थापन गरी संचित शक्ति वा तनावलाई क्षीण वा खुकुलो गरिदिन्छ ।

अन्तर-भूकम्प चरणको विकास पूर्ण भए पछि पूर्व - भूकम्प चरण सुरु हुनजान्छ । अन्तर-भूकम्प चरणको प्रकृयाको आधारमा पूर्व-भूकम्पमा हुनसक्ने प्रकृयावारे अवधारणा बनाई यी प्रकृयाको फलस्वरूप उत्पन्न हुने भूकम्पका पूर्व भौतिक लक्षणहरू (Precursor), जस्तै भूमिगत पानीको बहाव, राडोन ग्यासको बहाव, भूकम्पको दर तथा केन्द्र बिन्दुमा परिवर्तन, तर गतिमा परिवर्तन, भूतहको बिस्थापनको गतिमा परिवर्तन इत्यादिको मूल्यांन र प्रयोगात्मक अवलोकन तथा अध्ययन गर्नुपर्ने हुन्छ । यसको लागि सबभन्दा पहिले त अन्तर-भूकम्प चरणमा हुने प्रकृया कै पूर्ण समझदारी लिन आवश्यक छ । हाल खानी तथा भूगर्भ विभाग र फ्रान्सको DASE बाट संयुक्त रूपमा संचालित कार्यक्रमहरू यसै दिशा तर्फ उन्मुख छन् । साथै अन्य मुलुकहरूसंग पनि संयुक्त रूपमा यीनै प्रश्नहरूको समाधानार्थ विभिन्न बैज्ञानिक सर्भेक्षणहरू गर्ने कार्यक्रम छ ।

विगत ७ वर्षको राष्ट्रिय भूकम्प मापन केन्द्रको आकडाको अध्ययनबाट उपलब्ध भएको अर्को ठोस नतिजामा महाभूकम्प उत्पादन गर्न सक्ने नेपाल हिमालयका खण्डहरूको पहिचान हो । विगत सन् १९३४ (वि.सं. १९९०) मा गएको ८.३ म्याग्नेच्युडको महाभूकम्पले पूर्व अरुणदेखि पश्चिम त्रिशुली सम्मको खण्डको उत्तर उच्च हिमालको दक्षिण फेददेखि दक्षिण चुरीयाको फेदको परिवेशमा इण्डियन प्लेट उत्तरतिर बिस्थापित भएको थियो । यस अनुसार यस भूकम्पले पूर्व-पश्चिम करिब २०० कि.मि. को खण्डलाई बिस्थापन गरेको थियो । त्यस्तै, पश्चिम नेपालमा त्रिशुलीदेखि भेरीसम्म र भेरीदेखि महाकालीसम्म अर्का दुई महाभूकम्प उत्पादन गर्नसक्ने खण्डहरू सुक्ष्म भूकम्पको केन्द्र बिन्दु तथा भौगर्भिक आकडाहरूको विश्लेषणबाट दृष्टिगत हुन्छ । त्यस्तै, पूर्वमा अरुणदेखि मेचीसम्म अर्को एक खण्ड दृष्टिगत हुन्छ । साधारणतया हजारौं वर्षदेखि महाभूकम्पहरूले उहि उहि खण्डहरूलाई मात्र बिस्थापन गर्दै आएको हुदा यस्ता खण्डहरूको पहिचानबाट भूकम्प श्रोतको अवधारणा विकास हुनगई भूकम्प प्रकोप मूल्यांनमा सघाउ पुग्न जान्छ । यस किसिमको उहि उहि खण्ड बिस्थापित हुने मोडेललाई भूकम्प शास्त्रमा विशेष भ्रंस मोडेल (Characteristic Fault Model) भन्ने गरिन्छ । हाल सम्मको आँकडा तथा विश्लेषण अनुसार उपरोक्त सबै महाभूकम्पका खण्डहरू अन्तरभूकम्प चरणमै रहेका हुदा एक नासले इण्डियन प्लेटको चाप बढ्दै गइरहेको देखिन्छ । यी खण्डहरूमा पूर्व भूकम्प चरणको सुरुआत तथा विकास प्रक्रिया समयमै पहिचान गरी भूकम्पको भविष्यवाणिलाई यथासंभव यथार्थ पार्नु पर्ने देखिन्छ । साथै संबन्धित निकायहरूलाई समयमै सूचना दिई भूकम्प प्रकोपको न्यूनीकरण प्रयासमा सघाउ पुझ्याउनु पर्ने जवाफदेही हुनजान्छ । प्रकृयादेखि अवलोकन पद्धतिसम्म सम्पूर्ण कुरा अध्ययन-अनुसन्धान गरी लागु गर्नु पर्ने हुदा त्यति सजिलो किमार्थ छैन ।

(कान्तिपुर दैनिक, ४ श्रावण २०५७)

दाङको भौगर्भिक वनावट र विकासका सम्भावना

मेघ राज धिताल
केन्द्रीय भूगर्भ विभाग, त्रिभुवन विश्वविद्यालय
कीर्तिपुर, काठमाडौं

१. परिचय

दाङ जिल्लालाई चिनाउने यसका दुई सुन्दर उपत्यकाहरू नै हुन् । हिमालयको दक्षिणी काखमा अवस्थित यस्ता विभिन्न उपत्यकाहरू दक्षिणमा भारतको देहरादुन पश्चिममा पाकिस्तानदेखि पूर्वमा सिक्किमको टिस्टा उपत्यकाबाट बर्मासम्म छरिएर रहेका छन् । ती मध्येका केही ठूला उपत्यकामा दाङ तथा देउखुरी उपत्यकाहरू पर्छन् । त्यहाँ पहिले बाक्लो जङ्गल थियो र विभिन्न आदिवासीहरू बसोवास गर्दथे । दाङमा कालान्तरमा तराईबाट आएका थारु जातिहरू खोलाका किनारहरूमा बस्दै गए र जङ्गल फँडानी गरी खेतीपाती गर्ने प्रचलन चल्यो । दाङ उपत्यकालाई जोड्ने मुख्य सडकहरूमा लमही-घोराही-तुलसीपुर सडक, तुलसीपुर-अमिलिया सडक, घोराही-प्यूठान सडक तथा तुलसीपुर-सल्यान सडक पर्दछन् । त्यसैगरी, देउखुरी उपत्यकामा पूर्वपश्चिम राजमार्ग भालुवा, लमही हुँदै अमिलियासम्म पुगेको छ भने, भालुवा-प्यूठान सडक यसको पूर्वोत्तर कुनामा छ ।

२. भौगोलिक अवस्थिति

दाङ तथा देउखुरी उपत्यकाहरू ८२ डिग्रीदेखि ८३ डिग्री पूर्वी देशान्तर र २७ डिग्रीदेखि २८ डिग्री उत्तरी अक्षांशमा अवस्थित छन् । दाङ उपत्यका, देउखुरी उपत्यका भन्दा झण्डै १० किमि उत्तरतिर अवस्थित छ । तथा देउखुरी उपत्यकामा करिब ३० कि.मि. पश्चिमबाट सुरु भई देउखुरी उपत्यकाको पश्चिमी किनारा भन्दा झण्डै ३० कि.मि. पश्चिमसम्म फैलिएको छ । दाङ उपत्यकाको सरदर उचाई ७०० मिटर र देउखुरीको ३०० मिटर छ ।

दाङ उपत्यकाको स्वरूप अण्डाकार छ र यसको पूर्व पश्चिमको अधिकतम लम्वाई करिब ५० कि.मि. र उत्तर दक्षिणको अधिकतम चौडाई करिब १७ कि.मि. छ । यसको क्षेत्रफल करिब ५४० वर्ग कि.मि. छ । दाङ उपत्यकाको उत्तरमा महाभारत पर्वत छ । दाङ उपत्यकाको उत्तरमा महाभारत पर्वत श्रृंखला र अन्य तीनतिर शिवालिक अथवा चुरे पर्वत पर्दछन् । दाङ उपत्यकाको प्रमुख नदी बबई हो । यो नदी उपत्यकाको दक्षिणी सिमानामा पूर्वबाट पश्चिमतिर बग्छ र अन्य सबै नदी र खोलाहरू यसमै समाहित हुन्छन् । उत्तरबाट दक्षिणतिर बग्ने प्रमुख खोलाहरूमा कटुवाखोला, सेवार खोला, गुर्जे खोला, हापुर खोला, चहुवा खोला, ग्वार

खोला, पातु खोला, भमके खोला, बहुला खोला, च्याटी खोला र कालाखोला पर्छन् भने तुई खोला पूर्वबाट पश्चिम बग्दै बबईमा मिल्नुभन्दा पहिले दक्षिणबाट उत्तरतिर बग्छ । बबई नदी पुरनधाराबाट दाङ उपत्यकालाई छोडी चुरे पर्वत छिचल्दै तराईतिर लाग्छ ।

दाङ उपत्यका करिब २०० मिटर जति गहिरो ढुङ्गा माटोको परतले छोपेर बनेको छ । त्यहाँका टारहरू उत्तरबाट दक्षिणतिर बग्ने नदी र बबई नदी तथा तुई खोलाले बनाएका दुबै किनारामा समानान्तर भएर फैलिएका छन् । सामान्यतः दाङ उपत्यकाका टारहरू उत्तरपूर्वतिर अग्ला छन् र क्रमशः दक्षिणपश्चिमतिर होचा हुँदै गएका छन् ।

देउखुरी उपत्यका लाम्बिलो आकारको छ तथा यो पूर्व-पश्चिम फैलिएको छ । यसको पूर्व-पश्चिमको अधिकतम लम्वाई करिब ५० कि.मि. तथा उत्तर-दक्षिणको अधिकतम चौडाई करिब १२ कि.मि. छ । यसको क्षेत्रफल करिब ५०० वर्ग कि.मि. छ । देउखुरी उपत्यका चारैतिरबाट चुरे पर्वतमालाले घेरिएको छ । यसको मध्य भागबाट राप्ती नदी बग्छ । राप्ती नदी भालुवाडबाट देउखुरी उपत्यकामा प्रवेश गर्छ र झण्डै ९० डिग्रीको मोड बनाइ त्यहाँबाट यो पश्चिमतिर बग्दै अमिलियाको छेउछाउसम्म पुग्छ र त्यहाँबाट देउखुरी उपत्यकालाई छोडी, चुरे श्रृंखलाबाट बग्दै तराईतिर पुग्छ । देउखुरी उपत्यकाका अन्य महत्वपूर्ण नदीहरूमा अर्जुन खोला, ककाहा खोला, अमिलिया खोला र राङ्ग सिङ्ग खोला हुन् ।

दाङ उपत्यका भैं, देउखुरी उपत्यका पनि करिब १०० मिटर जति गहिरो बालुवा, गेरु र पागो माटोको परतले बनेको छ । राप्ती नदी भन्दा उत्तर तर्फका टारहरूको क्रमशः उत्तरबाट दक्षिणतर्फ र राप्ती नदीदेखि दक्षिणतर्फका टारहरूको क्रमशः दक्षिणबाट उत्तरतर्फ उँचाई घट्दै जान्छ । यस उपत्यकाको धेरै जस्तो स्थलरूप राप्ती नदीले छोडेर गएका टारहरूलाई अन्य खोलानालाहरूले कटान गरी बनेको हो ।

३. भौगर्भिक अवस्थिति

दाङ जिल्लामा पाइने चट्टानहरूलाई मोटामोटी रूपमा दुई भागमा विभाजित गर्न सकिन्छः उत्तरमा अवस्थित महाभारत श्रृंखलामा पाइने निम्न हिमालयका चट्टानहरू र त्यसभन्दा दक्षिणतिरका शिवालिक चट्टानहरू । हिमालयमै कम पाइने जीवाष्म भएका नुमुलिटिक चुन ढुंगा पातुखोला,

तोश, धारापानी तथा ग्वार खोलाको माथिल्लो भागमा पाइन्छन् भने, ज्वालामुखीबाट बनेका आग्नेय चट्टानका टुक्राटाक्री ढाडखोला (धान खोला) को शिव मन्दिर वरिपरि देखापर्छन् । दाँको उत्तरी भेगमा कोइलाका स-साना खानीहरू पनि छन् ।

३:१ दाँ तथा देउखुरी उपत्यका कसरी बने ?

महाभारत र शिवालिक पर्वत श्रृंखलाहरू क्रमशः उत्तरबाट दक्षिणतर्फ करिब १ सेन्टिमिटर प्रति वर्षका दरले सँदैछन् । यी श्रृंखलाहरू सम्पूर्ण हिमालय पर्वतमालाको दक्षिणी सिमानामा करिब २४०० कि.मि. लामो र ३० कि.मि. चौडा चन्द्राकार स्वरूप बनाई बसेका छन् । यसरी यी चट्टानहरू तराईतर्फ सँदै जाँदा खुम्चिन्छन्, बाङ्गिन्छन् र फुट्छन् पनि । यस्तो सँदै प्रकृया अत्यन्त मन्द गतिको भएता पनि कहिले काहिँ एकाएक चट्टान फुटेर खप्टनाले वा पहिलेकै सतहमा एक्कासी चिप्लनाले भुईँचालो आउँछ ।

चित्र १, २ तथा ३ मा दाँ तथा देउखुरी उपत्यकाको विकासक्रमको नमूना देखाइएको छ । चित्र १ मा उत्तर तर्फ महाभारत पर्वत देखाइएको छ भने त्यसको दक्षिणतर्फ पहिले तराई (तराई १) देखाइएको छ । उक्त पुरानो तराईको मैदान माथि त्यसबेलाका खोलानालाहरूले थुपारेर बनाएको पत्र पनि देखाइएको छ ।

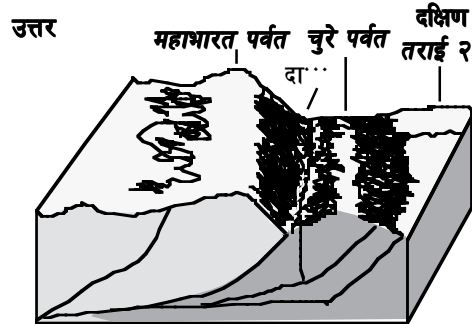
त्यो पत्र मुनि करिब ६ कि.मि. जति शिवालिक चट्टानहरू छन् । त्यो बेलाको महाभारत पर्वतको मुनि नयाँ चीराहरू बिस्तार हुँदैछन् । महाभारत पर्वतका निम्न हिमालयका चट्टानहरू त्यस्तै चीराहरूद्वारा शिवालिकका चट्टान माथि खप्टिएका छन् । चित्रमा अर्धतीरको चिन्हले चट्टानहरू सँदै दिशा पनि देखाएको छ । चित्र १ को अवस्थाको दृश्य करिब २०-२५ लाख वर्ष अगाडिको हो ।

चित्र २ मा सबभन्दा उत्तरतर्फ महाभारत पर्वत देखाइएको छ र बीचमा भर्खरै बनेको पहिलो चुरे श्रृंखला पनि देखाइएको छ र उक्त चुरे पहाडको दक्षिणतर्फ त्यो बेलाको तराई (तराई २) पनि दर्शाइएको छ । पहिलेको



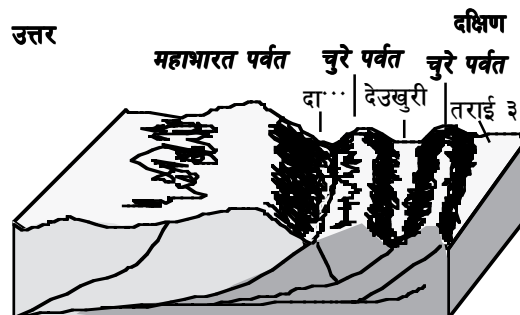
चित्र नं १: चुरे पर्वत बन्नु भन्दा अगाडिको अवस्था (२० लाख वर्ष पहिले)

तराई १को स्थानमा अब क्रमशः दाँ उपत्यकाको विकास हुँदैछ । यस बाहेक नयाँ चुरे पहाडका मुनि अन्य चीराहरू क्रमशः दक्षिणतर्फ बढ्दै गरेका पनि देखाइएका छन् । यस्तो दृश्य १० लाख वर्ष पहिले थियो होला ।



चित्र नं २ : दाँ उपत्यका बनिसकेको तर देउखुरी बन्नु भन्दा पहिलेको अवस्था (१० लाख वर्ष पहिले)

चित्र ३ मा हिमालय क्षेत्रको खुम्चने क्रम जारी हुँदा फेरि नयाँ चीराले तराई २ लाई छेडी त्यसको दक्षिणतर्फ अर्को नयाँ चुरे श्रृंखला बनेको दृश्य प्रस्तुत गरिएको छ । यस अवस्थामा आएर सबभन्दा उत्तरमा महाभारत पर्वत, त्यसको दक्षिणमा दाँ उपत्यका, त्यसपछि पहिलो चुरे पर्वत र अनि देउखुरी उपत्यका र त्यसको दक्षिणमा दोश्रो चुरे श्रृंखला देखिन्छन् । यो चित्र ३ अहिलेको अवस्थाको हो र भविष्यमा यो क्रम जारी रहेमा र नयाँ चीराहरू दक्षिणतर्फ बन्दै गएमा नयाँ चुरे पर्वतहरू अहिलेको तराई (तराई ३) मा बन्न सक्ने देखिन्छन् ।



चित्र नं ३: दाँ तथा देउखुरी उपत्यकाहरू बनिसकेको दृश्य

३:२ खनिजहरू

दाँ जिल्लामा विभिन्न प्रकारका खनिजहरू पाइन्छन् । ती मध्ये प्रमुख यस प्रकार छन् ।

३:२:१ सुन :

राप्ती नदीको तल्लो भेगमा वालुवामा मिसिएको सुनको मात्रा परापूर्वकालदेखि त्यहाँका विशेष जाति (खुनाहरू) ले चालेर जम्मा गर्ने गरेको पाइन्छ । एक प्रारम्भिक सर्वेक्षण

अनुसार उक्त सुन निकाल्न मध्यम स्तरको उद्योग संचालन गर्ने संभाव्यता देखिन्छ ।

३.२.२ कोइला:

दाँको उत्तरी भेग: तोश, सिउजा, सुक्याकोट, अजिमारा, भमके खोला, राम्री, बहुलाखोला र अन्य स्थानमा अहिले निम्नस्तरको कोइला उत्खनन् भइ बिक्रीवितरण भइरहेको छ । स-साना उद्योग धन्दा संचालन गर्न उक्त कोइला उपयोगी भए पनि वातावरणमा पनि दुःप्रभाव तथा कोइला निकाल्दा बाढी र पहिरो जाने खतरा बढ्ने कारणले तथा आर्थिक दृष्टिकोणले पनि ती खानीहरू संचालन गर्नु त्यति लाभप्रद देखिदैन ।

३.२.३ नून:

देउखुरीको रेहारमा भएको नूनिलो माटो गाइबस्तुलाई खुवाउन प्रयोग गरिन्छ । तर त्यहाँ कुनै ठूलो खानी छैन । यसको विस्तृत अनुसन्धान हुनु आवश्यक छ ।

३.२.४: चून ढुंगा:

दाँको उत्तरी भागमा प्रशस्त चून ढुङ्गाहरू पाइन्छन् । ती मध्ये केही सिमेन्ट निकाल्ने ग्रेडका पनि छन् । भविष्यमा दाँमा ठूलै सिमेन्ट कारखाना स्थापना गर्नसकिने सम्भावना छ ।

३.२.५ मार्बल र क्वार्जाइट:

दाँको उत्तरी भागमा विभिन्न किसिमका चुनढुङ्गा र क्वार्जाइट ढुङ्गा पाइन्छन् । ती ढुङ्गाहरूबाट मार्बल र क्वार्जाइटका स्ल्याब बनाउने उद्योग खोल्न सकिन्छ ।

३.२.६ स्लेट:

दाँको उत्तरी भागमा विभिन्न ठाउँहरूमा स्लेटका खानीहरू छन् । त्यस्ता स्थानहरूको अध्ययन गरी यस उद्योगलाई विस्तार गर्न सकिन्छ ।

३.२.६ बालुवा:

राप्ती नदी अत्यन्त ठूलो श्रोत हो । यो बालुवामा नगण्य मात्रामा अन्नक मिसिएकोले, नेपालका अन्य स्थानमा पाइने बालुवाभन्दा यसको गुणस्तर निकै राम्रो छ । यो बालुवा नेपाल र भारतका विभिन्न शहरहरूमा निकासी गर्न सकिन्छ । यसको निम्ति रेलमार्ग विस्तार गर्नुपर्ने हुन्छ ।

३.२.७ ढुङ्गा:

ढुङ्गा दाङको अपार श्रोत हो । विभिन्न साइजका ढुङ्गाहरू मेशिनबाट चालेर छुट्याई एग्रीगेट बेच्नाले ठूलै आर्थिक लाभ हुने सम्भावना छ । यसको सदुपयोग पनि रेलमार्गको माध्यमबाट ढुवानी गर्दा हुने देखिन्छ ।

३.२.८ कालीमाटी, कमेरो र रातोमाटो:

दाँ र देउखुरीका विभिन्न स्थानमा कालीमाटी, कमेरो, पहेँलो माटो र रातो माटो पाइन्छन् ।

यिनीहरूबाट भाडाकूडा, कप, प्लेट इत्यादि तथा डिप्रिलि मययोग हुने माटोको साथै, सिमेन्ट बनाउदा प्रयोग गर्न र रड बनाउन प्रयोग गर्न सकिन्छ । त्यसबाहेक, ठूलो स्तरमा ईटा, टायल, पाइप इत्यादि माटाका संरचनाहरू बनाउने कारखाना स्थापना गर्न सकिन्छ ।

३.२.९ पेट्रोलियम पदार्थ:

दाँको दक्षिणी भेग र देउखुरीको मध्य भागमा पेट्रोलियम पदार्थ हुन सक्ने संभावना छ । तर यसको अहिलेसम्म विस्तृत अनुसन्धान भइसकेको छैन ।

३.२.१० तातो पानी:

रेहार, सुरङ्खोला र अन्य केही ठाउँमा तातो पानी फेलापरेको छ । यस्ता ठाउँहरूमा Resort/Rest House होटेल, इत्यादि स्थापना गरी फाइदा लिनसकिन्छ तर हालसम्म यसको अध्ययन नगण्य मात्र भएको छ ।

दाँको जिल्लाको अहिलेसम्म राम्रो भौगभिक नक्सा नभएकोले खनिज तत्वको विस्तृत खोज र अन्वेषण हुन बाँकी नै छ ।

४. दाङका प्राकृतिक सम्पदा

माथि उल्लेखित खनिज तत्व बाहेक दाँका अन्य प्राकृतिक सम्पदाहरूमा जलश्रोत, काठ र जडीबुटीहरू पर्दछन् । दाँ र यसको छेउछाउमा निम्न जलविद्युत आयोजनाहरू संभाव्य छन् ।

४.१ शारदा जलविद्युत आयोजना:

दाँको उपत्यकाको पश्चिमी सिमानामा शारदा नदीबाट जलविद्युत निकाल्ने क्रममा विभिन्न अध्ययन भइसकेका छन् ।

४.२ भालुखोला जल विद्युत आयोजना:

राप्ती नदीको उद्गम स्थल अर्थात् माडी खोला तथा फिमरुक खोलाको दोभान (ऐरावती) मा बाँध बनाइ त्यसको तल रातोमाटेमा राप्ती नदीको पानी खसाली बनाइने जलविद्युत आयोजना पनि अहिलेसम्म अध्ययनकै क्रममा छ ।

४.३ साना जलविद्युत आयोजनाहरू:

दाँको माउत्तरतिरबाट प्रवेश गर्ने धेरै नदी र खोलाहरूमा साना जलविद्युत आयोजना निर्माण गर्न सकिन्छ । त्यसबाट आएको पानी सिँचाई तथा खानेपानीको रूपमा दाँमा प्रयोग पनि गर्न सकिन्छ । तर यस प्रकारको बहुउद्देश्य भएको आयोजनाको हालसम्म अध्ययन भएको छैन ।

४.४ मिनरल वाटर:

पुरनधारा, मूलकोट, धारापानी तथा ग्वारखोलाको उत्तरी भेगमा ठूलठूला मूलहरू छन् । जसको सही सदुपयोग गरेमा खानेपानीका साथै मिनरल वाटरमा आधारित उद्योगधन्दाहरू पनि स्थापित गर्न सकिन्छ ।

माथि उल्लेखित जलश्रोत बाहेक विभिन्न किसिमका काठ (साल, सिसौ, साज, खयर, चिलाउने आदि)को वैज्ञानिक किसिमले उत्पादन र उपयोग गर्न सके मनग्य आर्थिक लाभका साथै रोजगारीको पनि व्यवस्था गर्न सकिन्छ । त्यस बाहेक अचेल पहाडबाट तुलसीपुर र घाराहीमा चोरी निकासी

भई आउने जडीबुटीलाई पनि व्यवस्थित गर्नुपर्ने र यसको खेती तथा विस्तार गर्नुपर्ने देखिन्छ । अर्को तर्फ, लोक्ता जस्ता बिरुवाहरूको विकास गरी नेपाली कागजका साथै अन्य कागज कारखानाको संभाव्यता पनि निकै छ ।

५. दाङका प्रमुख प्राकृतिक तथा आर्थिक समस्याहरू

जनसंख्याको चाप, संरचनाहरूको जथाभावी तवरले निर्माण, वन विनाश तथा उर्वरा जमिनको क्षयीकरणले दाङ जिल्लाको वातावरणलाई नराम्रो असर पारेको छ । त्यस्ता केही प्रमुख समस्याहरू यस प्रकार छन् ।

५.१ बाढी:

ग्वार खोला, हापुर खोला, पातु खोला र अन्य उत्तरबाट दक्षिणतिर बग्ने खोलाका साथै राप्ती नदीको बाढीले दाङजिल्लालाई वर्षेनी क्षति पुऱ्याउँछ ।

५.२ पहिरो:

अतिवृष्टिले र जथाभावी ढङ्गले सडक र नहर निर्माण गर्ने कार्यले दाङ जिल्लाका पहाडी भेगहरूमा ठूला-ठूला पहिरा प्रशस्त देखिन्छन् । भालुवाङ-सुरेन्द्रनाका क्षेत्रका पूर्व-पश्चिम राजमार्गमा यस वर्षको वर्षाले निकै पहिराहरू भरेको छ । त्यसैगरी, घोराही-प्यूठान तथा दाङ-सल्यान सडकमा पनि पहिरोले निकै क्षति पुऱ्याएको छ ।

५.३ भूक्षय:

भूक्षय दाङ जिल्लाको एक प्रमुख समस्या हो । वनस्पतिको विनाश र गाई-वस्तुहरूको अत्यधिक चरनको प्रभावले जमिनको उर्वरा शक्ति ह्रास भै रहेको छ भने, अर्को तर्फ रासायनिक मलको अत्यधिक प्रयोगले माटोको गुणस्तरमा ह्रास ल्याउने मात्र नभई खोला तथा भूमिगत जलमा पनि कु-प्रभाव पार्न थालेको छ ।

५.४ धेरै पानी: थोरै पानीको समस्या:

दाङ जिल्लामा वर्षायाममा अति धेरै पानीले समस्या उत्पन्न गर्दछ भने सुख्खा याममा पानीको अभाव त्यतिकै खट्किन्छ । यस्तो हुनुको मुख्य कारण त्यहाँका टारहरूलाई खोला र नदीहरूले निकै गहिरो गरी काट्नु हो । त्यहाँका टारहरूमा भूमिगत जलको सतह अत्यन्त चाडो तलमाथि गर्छ भने, धेरैजस्तो खहरे खोलाहरूले सतहको पानी बबई तथा राप्ती मा तुरुन्तै पुऱ्याइदिन्छन् । तराईमा जस्तो, ठूलो भावर क्षेत्र दाङ तथा देउखुरी उपत्यकाको उत्तरतिर नहुदा वर्षाको पानी भूमिगत जल बनी जमिन भित्र पस्ने संभावना कमै छ । अर्को तर्फ, पहाडबाट आउने खोलाहरूले वर्षा याममा थुप्रै ढुङ्गामाटो ल्याउने भएकोले वर्षापछि खोलाको पानी बगरमुनिबाट बग्दा सिंचाई गर्न समस्या उत्पन्न हुन्छ । मध्य दाङ उपत्यकाको ठूलो भाग तथा देउखुरी उपत्यकाको दक्षिणी भेग स्वस्थ खाने पानीको अभावमा पिल्सिरहेका छन् ।

५.५ ऊर्जा तथा इन्धनको समस्या:

धेरै जस्तो गाजुलेहरूले इन्धनको अभावमा गुईँठाको रुपमा गोबरको व्यापक प्रयोग (बालनमा) गर्ने गर्दा एकातर्फ जनस्वास्थ्यमा नकारात्मक प्रभाव पर्न गएको छ भने जमिनको उर्वरा शक्तिको पनि ह्रास भएको छ । यसले अत्यन्त रुग्ण अवस्थामा रहेको चुरे पर्वत तथा महाभारत पर्वतको वनलाई पनि दिनानुदिन बढी चापमा पारिरहेको छ । दाङ जिल्लामा विद्युतवितरण नगण्य रुपमा मात्र छ ।

५.६ यातायात तथा संचारको समस्या:

उत्पादन भएका कृषिजन्य बस्तुहरू बजारसम्म पुऱ्याउनु होस् अथवा अन्य कार्यको लागि समान ढुवानीगर्न होस् दाङ मापूर्याप्त मात्रामा सडकको विस्तार भैसकेको छैन । अर्को तर्फ स्वास्थ्य, उद्योग, शिक्षा र विकासनिर्माणमा सोभ्रो असर पार्ने संचार माध्यमहरूबाट पनि बहुसंख्यक दाङ जिल्ला वासीहरू वान्छित छन् । बढ्दो शहरीकरणको चापले सुविधामुखिहरू शहरतिर बसाईसर्ने अस्वस्थ प्रचलन दाङ जिल्लामा पनि बढ्दो छ ।

६. समस्याका केही मानवीय पक्षहरू

दाङ तथा देउखुरी जस्तै अन्य धेरै हिमालय पर्वतका उपत्यकाहरूको तुलनामा यी दुई उपत्यकाहरू विकासको दृष्टिकोणले निकै पछाडि परेका छन् । यसका केही मानवजन्य कारणहरू निम्न छन् ।

६.१ राजनैतिक प्रतिवद्धताको अभाव:

जन्म, बसाई-सराई, चुनाव क्षेत्र, अथवा त्यहाँका दलप्रतिको प्रतिवद्धताको आधारमा जिल्लालाई उपयोग गर्ने राजनैतिक परिपाटीको शिकार दाङ भएको छ । हरेक घरघरमा फरक पार्टीहरू हुनु, हरेक पार्टीका विकासका ठूला-ठूला नारा हुनु, किताबी ज्ञानको आधारमा राजधानीमै बसेर कागजी योजनाहरू बनाइनु, चुनाव जित्ने उद्देश्यले अभिप्रेरित विभिन्न पार्टीका विकासका रणनीति र कार्यनीति बन्नु तथा पद र अधिकारको व्यापक दुरुपयोग हुनु नै राजनैतिक टाटपल्टाइ हो ।

६.२ सामाजिक सौर्णतावाद:

दंगलीवाद, देउखुरेवाद, पूर्वीयावाद, संस्कृतवाद, बाहुनवाद, जैसीवाद, उपाध्यायवाद, थारुवाद, दलितवाद, जमिनदारवाद र कमैयावादले दाङ जिल्लामा फल्नेफुल्ने र फस्टाउने मौका पाएका छन् । यी सामाजिक सौर्णतावादहरूले दाङ जिल्लामा बाटो बनाउनेदेखि लिएर विश्वविद्यालय र स्कूल खोल्ने सम्ममा व्यापक असर पारेका छन् । हरेक विकास आयोजनाहरू यिनीहरूको नियन्त्रणमा मात्र संचालित हुन्छन् ।

६.३ आर्थिक असमानता:

विकासका नाममा संचालित आयोजनाहरू मात्र देखावटी भएका छन् र तिनीहरूले आर्थिक असमानता घटाउनुको साटो धेरै हदसम्म बढाएका छन् । धनीहरू क्रमशः तुलसीपुर, घोरही हुँदै काठमाडौँ लाग्दैछन् भने गरीबहरू भएको जेथा विक्री गरी अर्काको घरखेतमा काम गर्ने गर्छन् ।

६.४ प्राथमिकीकरण गरी योजना संचालन नहुनु:

नेपाललाई ५ विकास क्षेत्र, १४ अञ्चल र ७५ जिल्लामा विभाजित गरे पनि अहिलेसम्म हरेक क्षेत्र, अञ्चल वा जिल्लाहरूमा प्राथमिकताको आधारमा आवश्यक योजना संचालन भएको पाईंदैन । अर्थविद्, योजनाकार र राजनीतिज्ञहरूमा मात्र सीमित हाम्रा जथाभावी र हचुवा तालले सीमित स्वार्थमा नीहित योजनाहरू दीर्घकालीन, टिकाउ र विकासोन्मुख हुँदैनन् ।

६.५ श्रृजनशील सोचाइको अभावमा:

आधारभूत ज्ञान र सीपको अभावमा पनि कुनै दलप्रतिको संलग्नता, नातावाद वा अन्य अवान्छित तरिकाले पद, पैसा र शासन हात पारेका तथा कथित सर्वज्ञानी विशेषज्ञहरूले श्रृजनशीलताको अन्त्य गरिदिएका छन् । कुनै पनि स्थान आफैमा अविकसित हुँदैन, मात्र त्यहाँका प्राकृतिक र मानव श्रोतको सही ढङ्गले परिचालन नहुनुले विकासमा तगारो हाल्छ ।

६.६ दूरदृष्टिको अभाव:

विकास एउटा प्रकृया भएकोले यसलाई निरन्तरता दिनु र सही ढङ्गले डोयाउनु आवश्यक हुन्छ । माथि उल्लेखित समस्याहरूको एउटा असर भविष्यको चिन्ता नै नगरी, क्षणिक लाभ र निहित स्वार्थमा आधारित विकास आयोजनाहरू संचालन हुनु हो । यस्ता आयोजनाहरू अन्ततोगत्वा फलदायी हुँदैनन् ।

७ उपसंहार

माथिका पृष्ठहरूमा प्राकृतिक र मानवजन्य समस्याहरूको परिप्रेक्षमा दाङ जिल्लालाई उभ्याइयो । दाङ जिल्लाको राजनैतिक, सामाजिक र आर्थिक पक्षका साथै प्राकृतिक पक्षलाई पनि समेटेर तयार पारिएका विकासका कार्यक्रमहरू निश्चय पनि लाभदायक र दूरगामी प्रभाव छोड्ने खाले हुने छन् भन्नुमा कुनै अत्युक्ति नहोला ।

दाङ जिल्लाको आफ्नै विशिष्ट भौगर्भिक, भौगोलिक र पुरातात्विक स्थान मात्र छैन, यसका मनोरम खोला, छहरा, फाँटहरू र पाखाहरूले सबैको मन लोभ्याउन सक्छन् । विकासको दौडमा र निर्माणको क्रममा हामीले यसको प्राकृतिक छटालाई अलिकति पनि नबिगारी सुन्दर तथा सुरम्य उपत्यकाको धरोहर हाम्रा सन्ततिहरूलाई हस्तान्तरण गर्ने जमर्को गर्नु आवश्यक छ ।

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Current Status of Coal Deposit of Nepal

Ramesh K. Aryal

Kathmandu Natural Gas Project

BACKGROUND

In Nepal, coal occurs within three stratigraphic horizons and can be classified broadly into four major types:

- the Quaternary lignite of the Kathmandu valley;
- the Siwalik coal of the sub-Himalaya;
- the Lesser Himalayan (Eocene) coal of western and Mid-Western Nepal; and
- the Lesser Himalayan Gondawana coal of Eastern Nepal.

Among the four identified coal types, the Quaternary lignite deposit of Kathmandu valley and the Cretaceous-Eocene coal of Mid-Western Nepal are of economic significance.

The Siwalik coal, though widely distributed throughout the sub-Himalaya is very small and sporadic by nature and is not commercially

exploited. Likewise, the Gondawana coal deposits of Eastern Nepal are very small in size and of low grade. Hence, they are not of any economic significance (Fig. 1).

QUARTERNARY LIGNITE DEPOSIT OF KATHMANDU VALLEY

The fluvio-lacustrine sediments of the Kathmandu valley are characterised by the occurrence of a large number of carbonaceous material varying from carbonaceous clay, impure fissile peat, to lignite seams. The most important occurrence of lignite deposits in the Kathmandu valley is located at Lukundol, Pharping, and Daksinkali, in the southern fringe. The coal occurrences around Kapan and Gokarn area in the north represent the minor lignite beds.

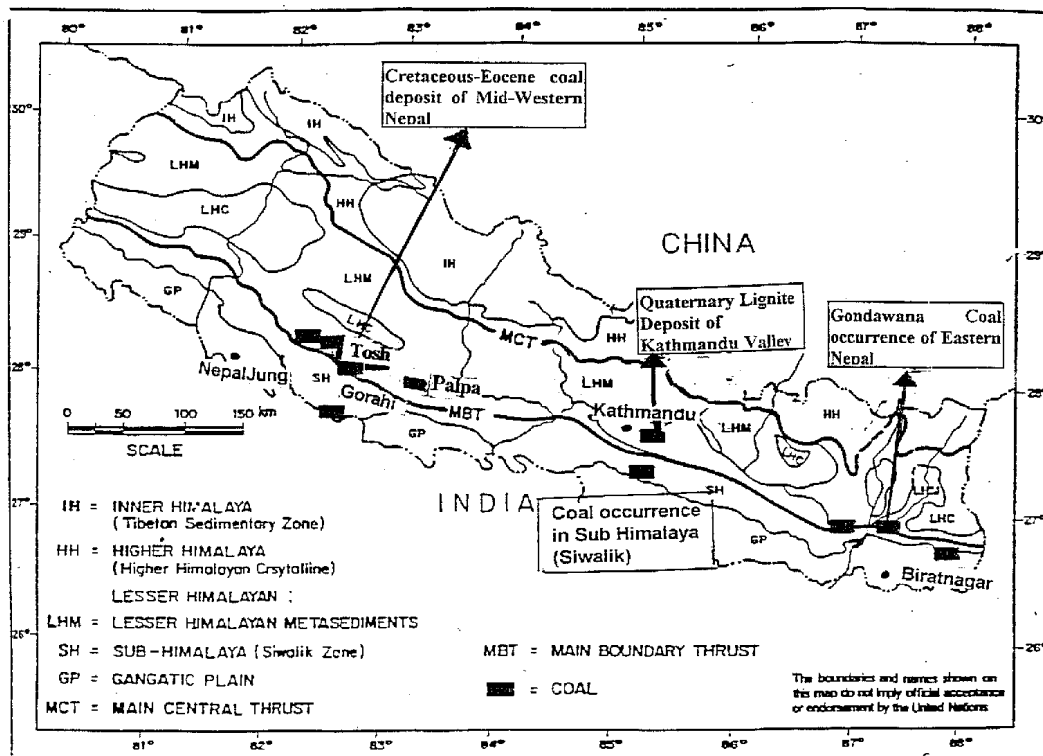


FIG.1: LOCATION MAP OF COAL DEPOSIT OF NEPAL

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and
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on
the auspicious occasion
of
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Lukundol area

Several sub horizontal (1° to 18° , NE), lignite seams occur in the Lukundol Formation at Lukundol. These seams, in general, vary in thickness from 1 m to 3 m and more. The lignite in general is soft, brown to black colour with poor to moderate lamination and has dull to glossy lustre. The deposits are situated 25 to 35 km south of the Katmandu valley.

In the past, about 5000 to 7000 tons of lignite was produced per year. Exploitation of lignite from the area has been suspended temporarily due to groundwater problems in the adit.

The approximate analysis of representative lignite samples from the Lukundol area have following chemical composition:

Moisture : 7- 11%, volatile matter : 33-38%, ash : 42-47%, sulphur : 0.1-0.2%, fixed carbon : 7.5 - 15% , and the average calorific value is 7560 BTU.

COAL DEPOSITS OF WESTERN NEPAL (CRETACEOUS-EOCENE)

In the Lesser Himalayan region of Dang, Syllan, and Rolpa districts, Mid-Western Nepal, and Palpa in Western Nepal, the coal-bearing Eocene carbonaceous shale and black shale of Oligocene age are found to occur associated with highly sheared and fractured ferruginous orthoquartzite and green quartzitic sandstone with coal occurring at different levels of exposed rock. These coal occurrences in the region are related to a belt of intense shearing and crushing, more or less following the bedding.

Though the coal beds appear as pockets or stringers in the exposure, which however, in the deeper excavation occur along the bedding plane of the quartzite giving rise a stratified deposit of coal in the region. Some of the major coal deposits of Nepal are the following.

Coal Deposit of Tosh Area

The Tosh coal deposit is located at an altitude of 1,200 m and is approximately 18 km north of Ghorai Bazaar. The Gorahi, a district head quarter of Dang district is about 300 km. west of Kathmandu, the capital city of Nepal.

Three workable coal seams, Tosh-I (the bottom most unit), Tosh-II (middle one) and Tosh-III (the top most unit) in the region are found to occur in association with intensively folded and faulted quartzites. The general strike of the coal bearing ferruginous quartzites bed in the area is NW-SE with a NE dip of 20° - 50° .

In general, the coal is highly friable and ranges in thickness from 1.10 m to 2.2 m. The coal seams extend to a strike length of 2 km, with width being 200 m.

The Tosh prospect was drilled to a total length of 242.72 at three potential target points : DDH-1, DDH-2 and DDH-3. About 0.5 million tons of deposit is calculated in the area of 0.4 sq. km.

In general the coal has following chemical composition :

Moisture content: 1.3%, Volatile Matter : 21.7%, Ash content: 16.9%, Fixed carbon: 60% and the Calorific Value is 7212 kcal/kg.

Production from 3 operating mines in the Tosh is about 60 tons/day (seasonal).

Coal occurrence of Siujaa area

The Siuja deposit is located east of the Tosh deposit, lies approximately at same altitude (1,150 to 1,300 m) to that of Tosh. The area lies about 26 km north-east of Ghorai bazaar and about 13 km north-west of Harnok, a point on Ghorahi- Libang-Pyuthan road.

Unlike Tosh area, the coal deposit in seuza area is not concentrated only in Seuza, but occurs widely in and around Seuza. The average thickness of the coal deposit varies from 1.8 m to 2.5 m. Average chemical composition of the coal is very near to that of Tosh area.

The area produces about 40 tons of coal per day (seasonal).

Coal deposit of Tulsipur-Kapurkot area

Almost all the coal deposits in the region are located at an altitude of 1,050 to 1,300 m and lie about 15 km north and north east of Tulsipur, near Kapurkot.

The coal in these region is found associated mainly with ferruginous orthoquartzite bed within the carbonaceous shale. A few of the coal deposits in the region are found associated with green quartzitic sandstone also. The coal seams on an average are about 1 m to 2.5 m in thickness and extend along the strike for 200-500 m. The general strike of the coal-bearing rock in the area is NW-SE with a NE dip of 20° - 50° .

The main coal producing areas are as follows:

- **Kapurkot area:** Sibang, Snarpani and Pakhapani produce approximately 15 tons of coal/day (seasonal)
- **Tulsipur area:** Abhidhara and Naulopani, produce approximately 10 tons/day (seasonal)

COAL DEPOSITS OF PALPA AREA

In Tansen area of western Nepal, the Eocene beds (Bhainskati Fm) and the possible Oligocene to early Miocene beds consisting of non marine green quartzite and red shale (Dumri Formation) are found containing thin beds of coal.

The Amile Formation, typical deltic sedimentary facies consists mostly of thick bedded, massive white quartzite, which is mottled with ferruginous matter and includes inter bands of black shale and coal beds. It is found to occur in the south and north of Tansen, along the both limbs of a regional synclinalorium, known as the Tansen Synclinalorium.

At Simaldi area, about 30 km east of Tansen, the coal seam with average thickness of about 1.90 m extends along the strike for more than 2,000 m. The availability of coal in the area is expected to be more than 20,000 tons. The coal appears to be of sub-bituminous.

At Chirtung Danda, about 30 km east of Tansen, about 5 m thick carbonaceous shale is found. The coal in the carbonaceous shale is about 0.70 m thick and is of sub-bituminous in grade.

The minor occurrences of coal are seen around the Agha Khola and Purba Khola.

COAL OF ?GONDWANA AGE

Ajimara

Anthracite-bearing carbonaceous shale lenses and beds occur at the Ajimara village area of Dang. This rock sequence, considered equivalent of the Gondwana Formation in India, and forms an independent tectonic unit lying between the Siwalik rock to the south and the

Late Paleozoic Triassic Group of rocks to the north. The general strike of the coal-bearing rock in the area is NE-SW with a NE dip of 20°-60°.

The exposed coal being highly tectonised is friable in nature and is more than 8 m in thickness. It extends along the strike for more than 50 m.

Due to the collapse of exploration adit, the exploitation of the coal in the Ajimara area has been temporarily suspended. However, in the past the mine used to produce about 20 tons of coal per day.

The chemical composition of coal is the following.

Moisture content: 1 to 6%, volatile matter: 7 to 8%, ash content: 15 to 19%, fixed carbon: 72%, and calorific value: 7521 kcal/kg.

4.2 Barahakshetra Area :

Minor occurrences (lenses and beds) of anthracitic coal in the carbonaceous shale are known to occur within the continental and marine rock series near the Barahakshetra and Kampughat areas of Eastern Nepal.

5. UTILISATION

The coal of this part of Nepal is mostly used in brick factories, in domestic use as a briquette, and in paper factory for making pulp. The present coal production covers nearly 20 to 25% of the national demand (180,000 tons) of the country.

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PARTICIPATION/REPRESENTATION OF NEPAL GEOLOGICAL SOCIETY IN VARIOUS MEETINGS AND ACTIVITIES

Mr R. K. Aryal, President, Nepal Geological Society, on behalf of NGS took part in the 2 day Workshop on Disaster Implementation Manual Preparation at Nagarkot, on 29 - 30 October 1999.

Mr R. K. Aryal, President and Mr U. B. Shrestha, General Secretary, NGS, on behalf of NGS, took part in the "Role of Professional Societies in Promoting Science and Technology Capabilities" at Hotel Archit, Tripureshor, on 31 Ashadh 2056BS.

At the invitation of Mr R. P. Tandukar, Project Chief, PEPP/ DMG and Mrs. Ellinor Melbye, Project Director, PETRAD, Mr R. K. Aryal, President of NGS, took part in the Inaugural Ceremony of the Workshop on Negotiations of Petroleum Contracts on November 31 1999 at Hotel Himalaya, Lalitpur.

Mr R. K. Aryal, President of NGS and Mr K. P. Kaphle, Former President, NGS, took part in the Symposium on "Experiences of Earthquake Risk Management", organised jointly by NSET-Nepal, IOE, SCAEF, NEA, and SONA on 15 January 2000. In this symposium, eleven papers were presented by national and foreign scientists.

Mr R. K. Aryal, President, NGS, also took part in the Second Earthquake Safety Day - 2000 and in the Earthquake Safety Awareness Exhibition organised by NSET- Nepal in Bhrikuti Mandap, Exhibition Hall Kathmandu on 14 - 16 January 2000.

Mr R.K. Aryal, President, NGS, took part in the

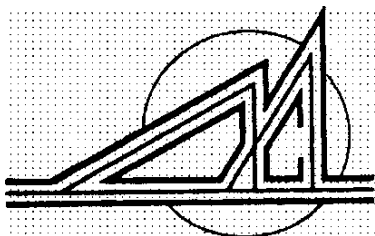
National Science and Technology Congress organised by Ministry of Science and Technology in the Ministry of Science and Technology, Singha Durbar on 16 Marga 2056BS.

Mr R. K. Aryal, President, NGS attended the Inaugural Session of **Teacher Training Programme on Earth and Environmental Science** organised by the Department of Geology, Tri-Chandra Multiple Campus, TU in collaboration with Ministry of Education, HMG /N and UNESCO on 10 March 2000.

Mr R. K. Aryal, President, NGS, took part in the delegation lead by Dr. K. L. Shrestha, Advisor to the Minister of Science and Technology to meet Hon. Prime Minister, Mr K. P. Bhattarai, in his office on 1st Chaitra, 2056 BS. On this occasion, Mr Aryal briefed about the geo-scientific activities carried out by the NGS in the past and also handed over a few volumes of the Bulletin and Journal of Nepal Geological Society to the Hon. Prime Minister.

Mr R. K. Aryal, President, NGS took part in the First Asia Meeting of CIS Graduates and the 40th Anniversary of RPFO organised by Mitra Kunj, Nepal on 9th March 2000. It was inaugurated by Rt. Hon. Prime Minister Mr K. P. Bhattarai.

Dr. B.N. Upreti, Former President of NGS, participated in the International 15th HKT Workshop-Seminar held in Peoples Republic of China on 15-22 April 2000.



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Membership Number	Name	Mailing Address
LM 437	Dr Dhanapati Haldar	International Wing Geological Survey of India Jawahar Lal Nehru Road, Calcutta, India
LM 438	Dr Deepak Raj Pant	RONAST Bijuli Bazaar, Nayabaneswor Kathmandu, Nepal
M 439	Ms Abha Shrestha	Central Department of Geology T.U., Kirtipur, Kathmandu, Nepal
LM 440	Mrs Manju Karki	Nepal Electricity Authority, Ratnapark, Kathmandu, Nepal
LM 441	Mr Pawan Karki	Department of Roads Babar Mahal, Kathmandu, Nepal
LM 442	Mr Ichchha Bahadur Nepali	Butwal Power Company Ltd. Lalitpur, Nepal
M 443	Mr Hari Nandan Gurumaita	Tribhuvan University Nepal
M 444	Mr Ram Chandra Osti	Pragatinagar-2 Nawalparasi, Nepal
LM 445	Mr Mahadev Prasad Joshi	P.O.Box 6717, Kathmandu, Nepal
LM 446	Mr Bishnu Raj Gautam	Butwal Power Company Ltd. Lalitpur, Nepal
M 447	Mr Devendra Prasad Shrestha	Civil Aviation Corporation Babar Mahal, Kathmandu, Nepal
M 448	Mr Shailesh Kumar Thapa	Trijuga Municipality - 12 Udayapur, Nepal
M 449	Mr Pragati Adhikari	Satdobato, Lalitpur - 15, Nepal
LM 450	Dr Md. Badrul Islam =	Department of Geology and Mining University of Rajshahi, Rajshahi 6205, Bangladesh
LM 451	Dr Rhawn Denniston	Department of Geology, University of Iowa Iowa 52242, USA
LM 452	Dr Yushiro Iwao	Civil Engineering Department Saga University Hunjo-1, Saga, Japan

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GEO-SCIENTIFIC TALK PROGRAMME

Nepal Geological Society has organised a geo-scientific talk programme/lecture on *The origin of Himalayan anatexis and inverted metamorphism: Model and constraints* by: Dr. T. Mark Harrison,

Professor at the Department of Earth and Space Sciences, University of California, Los Angeles, USA on Tuesday, 11th May, 1999 (2056-1-28) at 14:30 in the Auditorium of Dept. of Mines and Geology.

CALENDAR OF EVENTS

- ♦ **Conference on Geology and Ore Deposits 2000: The Great Basin and Beyond.** Reno-Spark, Nevada, USA, from 15-18 May 2000.

Contact:

Geological Society of Nevada
PO Box 12021, Reno Nevada 89510, USA
Tel: +1-702-323-3500 Fax: +1-702-323-3599
E-mail: gsnsymp@nbgm.unr.edu

Contact Address:

Secretariat ISPRS Organising Committee
C/O ITC Attn Ms Saskia Tempelman
P.O. Box 6
7500 AA Enschede, The Netherlands
Telephone: +31-53-487435
Fax: +31-53- 4874335
E-mail: isprsAitc.nl

- ♦ **Management Information System, Incorporating Remote Sensing,** Lisbon Portugal, organised by Wessex Institute of Technology, UK, from 3-7 July 2000.

Contact:

Gabriella Cossutta
Fax: +44 (0) 238-029-2853.

- ♦ **Joint World Congress on Groundwater.** Fortaleza, Brazil. 31 July to 4 Aug 2000.

Contact Address:

ABAS Ceara Chapter, Av. Santos Dumont
7700 Papicu, Fortaleza CEP 60150-163 Brazil.
Tel: +55852651288
Fax: 55852652212.

- ♦ **International Conference on Catastrophic Events and Mass Extinctions: Impacts and Beyond.**, Vienna, Austria from 9-12 July 2000, sponsored by University of Vienna, Lunar and Planetary Institute, European Science Foundation IMPACT Programme., Federal Ministry of Science and Transport, Austria, and Geological Survey of Austria.

Contact:

Elizabeth Wagganer
Impact 2000 Conference Lunar and Planetary Institute 3600 Bay Area Boulevard Houston
E-mail: wagganer@lpi.jsc.nasa.gov

- ♦ **History of Geological Pioneers.** August 3-5, 2000.

Contact Address:

D.M. Friedman
Northeastern Science Foundation. P.O. Box 746
15 Third Street Torrey Ny 12181, USA.
E-mail: <gmfriedman@juno.com>

- ♦ **31st International Geological Congress, *Geology and sustainable Development: Challenges for the Third Millennium*** Rio de Janeiro, Brazil. From 6-17 August 2000.

Contact Address:

31st IGC Secretariat Bureau, Av. Pasteur
404-ANEXO 31 IGC, Urca, Rio de Janeiro RJ.
CEP 22.290-240 Brazil.
Tel: +55-21-295-5847 Fax: +55-21-2958094
E-mail: 31igc@cristal.cprm.gov.br.

- ♦ XIXth Congress of the international society for photogrammetry and remote sensing (ISPRS) **GEOINFORMATION FOR ALL** is going to be held in Amsterdam, the Netherlands on 16 - 23 July 2000.

- ◆ **International Conference on Goldschmidt 2000.** Oxford, UK.

Contact Address:

P. Beattie, **From 3-8 September 2000**
Cambridge publications, Publications House,
P.O. Box 27, Cambridge UK CB1 4GL.
Tel: +44-1223 333438 Fax: +44-1223-333438.
E-mail: Gold2000@campublic.co.uk.

- ◆ **20th Regional meeting of Sedimentology. from 13 -15 Sept. 2000.** Ireland (Dublin)

Contact Address:

Pat. M. Shannon, Department of Geology
University College Dublin Belfield, Dublin 4
Ireland.
Tel: +53317062323. Fax: +53312837733
E-mail: p.shannon@ucd.ie

- ◆ **12th International Symposium on placer and weathered rock deposits.** Moscow, Russia from **25-29 Sept. 2000.** Pre-congress and post congress workshops and field excursion. **Abstract Deadline May1 2000.**

Contact Address:

Prof. Patyk. Kara N.G.
Secretary General, IGEM RAS,
35 . Staromonetny Per 109017 Moscow.
Tel: 7(095) 230-8427. Fax: (095) 230-2179
E-mail: rkv2000@igem.ru.

- ◆ International Association of Engineering Geology and Environment (IAEG) is going to organise an **International Workshop on Engineering Geology and Environment Planning**, sponsored by IAEG and Co-sponsored by UNESCO Earth Science Division and Federal Institute for Geosciences and Natural Resources (BGR) in Hannover, Germany on **October 10- 12 , 2000.**

Contact Address:

Dr. M Wallner
BGR, P.O.Box-510153, D-30631
Hannover, Germany
Tel: +49511-643-2422, Fax: +49511-643-364
E-mail: manfred.wallner@bgr.de

- ◆ **International Millenium Congress on Geoengineering,** Melbourne, Australia. in **October 2000.**

- ◆ **American Association of Petroleum Geologists (International Meeting),** Bali, Indonesia. from **15- 18 October 2000** (Provisional).

Contact Address:

AAPG Conventions Dept.
P.O. Box 979, Tulsa, OK 74101-0979, USA.
Tel: 1918 560 2679. Fax: 1-918 560 2684

International Association of Hydrogeologists (30th Annual meeting) from **23-27 October 200.** Cape Town, South Africa.

- ◆ **International Conference on, Geotechnical and Geological Engineering - Geoeng 2000. Fr om 19 -24 Nov 2000 .** Melbourne, Australia.

Contact Address:

Geo Eng 2000, ICM pty Ltd. 84 Queenbridge Street, South bank, Vic 3006, Australia.
Tel: +61-3-96820244. Fax: +61-3-9682-0288
E-mail: [<geoeng2000@icms.com.au>](mailto:geoeng2000@icms.com.au)

- ◆ **International Symposium and Field Workshop on Geodynamic Evolution of Himalaya - Karakoram- Eastern Syntaxis (Indo- Burma Range) Andaman Nicobar Island Arc and Adjoining Region.** Lucknow, India. From **11-16 Dec. 2000.**

Contact Address:

Prof. A.K. Sinha, Director, / Dr. Anil Chandra, Organising Secretary, Birbal Sahani Institute of Paleobotany, 53- University Road, Lucknow, 226001 India.
Tel: 0091-0522-333620 Fax: 0091-0522-381948
E-mail: [<bsip@bsip.sirnetd.ernet.in>](mailto:bsip@bsip.sirnetd.ernet.in)

- ◆ **International 16th Himalayan - Karakoram - Tibet Workshop/ Seminar is going to be held in Graz, Austria on 3 - 5 April 2001.**

Contact Address:

Dr. Kurt Stuwe
Institute fur Geologie und Palaeontologie,
University of Graz, Heinrichstr -26, A-8010
Graz, Austria.
Tel: +43 (316)380-5682 Fax: +43(316) 380-9870. Email: kurt.stuwe@kfunigraz.ac.at

- ◆ **American Association of Petroleum Geologists (Annual meeting), Denver, Colorado, USA from 3-6 June 2001.**

Contact Address:

AAPG Conventions Department
P.O. Box 979, 1444 S Boulder
Ave. Tulsa OK 74101-0979 USA.
Tel: +19185602679. Fax: +19185602684
E-mail: <dkeim@aapg.org.

- ◆ **International Symposium on Engineering Geological Problems of Urban Area** Organised by International Association of Engineering Geology and the Environment (IAEG). **30 July to August 2001.** Ekaterinburg, Russia.

Contact Address:

Secretariat, Eng. Geol City-2001
Ural TISIZ 79 Bazhov Str. Ekaterinburg
Russia 620075.
Tel: +73432559772. Fax: +73432550043
E-mail: UralTIS@etel.ru

- ◆ **5th International Conference on. Tokyo, Japan. From 23 - 28 Aug. 2001.**

Contact Address:

Prof. K. Kashiwaya
Dept. of Earth Sciences
Kanazawa University, Kanazawa
920-1192 Japan
E-mail: kashi@kenroku.kanazawa-u.ac.jp

- ◆ **American Association of Petroleum Geologists (Annual meeting), from 7-10 April 2002. Houston, Texas, USA.**

Contact Address:

AAPG Conventions Department
P.O. Box 979, 1444 S. Boulder, Ave. Tulsa
OK 74101-0979, USA.
Tel: +19185602679. Fax: +19185602684
E-mail: dkeim@aapg.org.

- ◆ **16th International Sedimentological Congress. July 7-12, 2002, Auckland Park, Gauteng, South Africa.**

Contact Address:

Bruce Cairncross
Dept. of Geology, Rand African University
P.O. Box 524, Auckland Park, 2006, South Africa.
Tel: +27224891312. Fax: +27114892309
E-mail: bc@na.rau.ac.za.

- ◆ **9th International Congress on Engineering Geology for Developing Countries** Organised by IAEG on **6-20 Sept. 2002, in Durban, South Africa.**

Contact Address:

The Technical Committee 9th IAEG Congress.
P.O. Box 1283. Westville 3630, South Africa.

The IAEG Council's meeting for 2000 will be held in Rio de Janeiro, on the opportunity of 31st International Geological Congress.

DECORATION AND AWARDS

¥ On the auspicious occasion of 55th Birthday of **His Majesty King Birendra Bir Bikram Shah Dev** decorated two of NGS members, Mr R. K. Aryal, President, and Mr K. P. Kaphle, Former President of NGS with **OPRABAL GORKHA DAKSHIN BAHU medal** for their devotion and efforts in organising the International Seminar successfully through the Nepal Geological Society.

¥ On the auspicious occasion of 55th Birthday of **His Majesty King Birendra Bir Bikram Shah Dev, HMG/ Ministry of Home** decorated Mr R. K. Aryal, President and Mr U. B. Shrestha, General Secretary, Nepal Geological Society, with **Daivi Prakop Uddhar Padak**.

¥ **His Majesty King Birendra Bir Bikram Shah Dev** awarded the **HONOURARY MEMBERSHIP of Nepal Geological Society** to two distinguished geoscientists: Professor Dr. Koshiro Kizaki from Japan and Mr Madhab Raj Pandey from Nepal on the auspicious occasion of the Inauguration of International Symposium on Engineering Geology, Hydrogeology and Natural Disasters.

¥ Ms. Saraswathi Menon, Deputy Resident Representative, UNDP, Nepal presented the **1998-UN Merituous Certificate**, awarded by the UN Humanitarian and Emergency Relief Coordination Office, IDNDR Secretariat, Geneva, Switzerland, to the Nepal Geological Society on the occasion of IDNDR Day-1999, in Kathmandu.

CONGRATULATIONS

Nepal Geological Society extends hearty congratulations to Mr Amod M. Dixit, Life Member and Coordinator, IDNDR Council of Nepal Geological Society as well as General Secretary, NSET-Nepal for the receipt of the **First World Seismic Safety Initiative (WSSI) Fellowship**. It was awarded for the recognition of his past achievements and his future potential.

The fellowship carries an award of US\$5000.00.

Nepal Geological Society also extends hearty congratulations to Dr . Indra Raj Humagain, Life Member of NGS for his successful completion of **Ph. D. degree** in Engineering Geology on 25 February 2000, from Rheinische Westfälische Technische Hochschule, Aachen, Germany.

RECENT PUBLICATIONS

New Books

Structural Geology: A practical guide to surface and subsurface map interpretation (TextBook) by R.H. Groshong . Springer , 1999, 320pp. ISBN 3540654224. Price DEM 129.00

Analytical solutions of Geohydrological Problems by G. A. Bruggeman. Elsevier, 1999, 970pp, ISBN0444818294. Price US\$465.00

Cambridge guides to minerals, rocks and fossils. by A. Woolley et al. Cambridge University Press, 1999. 336pp. ISBN 0521778816, Price US\$14.95

Earth Science and Environment (2nd edition) by Graham R. Thompson. Saunders College Publishing 1999. ISBN 0030060486.

Earthquake Geotechnical Engineering (Proceedings of the 2nd International Conference, Lisbon, Portugal, 21-25 June 1999, 3 Vols.) by P. Secoe Pinto. A. A. Balkema, 1100 pp. ISBN9058091163. Price US\$215.00

Environmental Assessment Practice Guide by Barbara Carol and Trevor Turpin. Thomas Telford Ltd. 1999. 150pp. ISBN 0727727818. Price UKL20.00

Flood and Landslide: Integrated Risk Assessment (Environmental Science), edited by R. Casale & C. Margottini. Springer, 1999, 450 pp hardback UKL96.00 ISBN 3540649816 Price DEM249.00

Geostatistics in Petroleum Geology by Oliver Du Burle, Continuing Education Course Notes #38. Cat. #908. The American Association of Petroleum Geologists. 1998. ISBN0891811877. Member Price US\$24.00, List price US\$30.00

Geostatistics for Engineers and Earth Scientists by R.A. Olea. Kluwer 1999. 328 pp. ISBN0792385233. Price NGL280.00

Geostatistics for Environmental Scientists by R. Webster & M.A. Oliver. John Wiley, 1999. 442pp. ISBN0471965537 Price US\$76.50

Geotechnical Engineering: Principles & Practices. by Donald P. Coduto. Prentice Hall 1999. 750pp, hardback. ISBN013576380. Price US\$110.00

Groundwater pollution control. edited by K.L. Katsifarakis. WIT Press, 1999. apx 350pp. ISBN 1853126756. Price UKL112.00

Hydrogeology and Engineering Geology of Sinkholes and Karst. (proceedings of the 7th Multidisciplinary Conference on Harrisburg Hershey. PA.USA. 10-14 April 1999) Edited by Barry F. Beck et al. A.A. Balkema, 1999. 480pp hard back, ISBN 9058090469. Price US\$115.00

On the determination of sediment accumulation rates (Georesearch Forum Vol5) Edited by P. Bruns & H.C. Hass. Trans Tech Publications Ltd. 1999. 256pp. ISBN 0878498370 Price UKL58.00

Slope Stability by Anderson. John Wiley 1999.
ISBN084934106x. Price DEM 108.00

Soil Mechanics and Geotechnical Engineering
(Proceedings of 11th Asian Regional
Conference, Seoul, Korea, 16-18 Aug. 1999)
edited by Sung-Wan Hong. A.A. Balkema
1999,. Two vols. 900 pp. Price US\$85.00.

Soil Mechanics and Geotechnical Engineering
(Proceedings of 12th African Regional
Conference, Durban, 25-27 Oct 1999).
Edited by Peter Day. A.A. Balkema, 1999,
3 vol. 1200 pp. ISBN9058090825.
Price US\$152.00

Mineralogy Tutorials: Interactive instruction on
CD-Rom Version 2.0 by C.K. Lein. John
Wiley 1998. Price US\$49.95

Dynamic Himalaya: By Prof. K.S. Valdiya.
published by University press (India)Ltd.
Hyderabad, Distributed by Orint Longman
Limited Calcutta, New Delhi, Patna,
Lucknow, Mumbai (Bombay)

Guide to Scientific and Technical Writing: By
Prof. P.G. Cooray. 426 Mahakanda Road,
Hindagala, Sri Lanka. Tel (08) 88541).
Price US\$5.00

Geological Field Notes and Sketches: By Prof.
P.G. Cooray. . 426 Mahakanda Road,
Hindagala, Sri Lanka Tel (08) 88541).
Price US\$5.00

Critical Aspects of the Plate Tectonics Theory
Vol.1: Criticism on the Plate Tectonics
Theory: Edited by Prof. V. Belousov, 1990,
435 pages. ISBN 960-7457-02-1.
Price US\$50.00

**Theophrastus's Contribution to Advanced
Studies in Geology Volume II:** Edited by
Prof. S.S. Augustithis et al, 1998, 281 pages,
ISBN 960-7457-12-9. Price US\$45.00
(post free)

Atlas of granitisation Textures and Processes:
By S.S. Augustithis, 1993. 500 pages, ISBN
960-7457-08-0. Price US\$75 (post free)

Magma & Crust Interactions and evolution
(Geochemical and Geophysical Aspects of
the Interactions and Evolution of Magmas
and Rocks of the Crust): Edited by prof. B.
Bonin et al 1989, 362 p. Price US\$38.00
(post free)

**Atlas of the Textural Patterns of
Metamorphosed (Transformed and
deformed) Rocks and Their Genetic
Significance:** By S.S. Augustithis 1985, 401
p. Price US\$65.00 (post free)

**Practical Applications of Trace Elements and
Isotopes to Environmental
Biogeochemistry and Mineral Resources
Evaluation.** Edited by Prof. R.W. Hurst et
al. 1987, 254 pages. Price US\$30.00
(post free).

A Global Geology by P.W. Harben and
M. Kuzvart, 1997. Price US\$198.00

Journal

Nepal Geological Society is regularly
publishing its **News Bulletin** and **Journal of
Nepal Geological Society**. The Society has
already published 27 volumes (Regular
volumes and Special Issues) of the Journal and
22 volumes of Bulletin. Recently, it has
published the **Proceedings of Second Nepal
Geological Congress**. The Proceedings
includes 32 scientific/research papers on
various fields of Geo-science. Journal of Nepal
Geological Society, Volume 20 (Special Issue)
is in sale and Journal of NGS Vol. 21 is in
press.

The Proceedings volume of **International
Symposium on Engineering Geology ,
Hydrogeology, and Natural Disasters with
Emphasis on Asia** is in the process of
publication.

AWARENESS ABOUT NATURAL DISASTERS

Following awareness booklets and reports are available in the Library of NGS for consultation.

- Bhuichalo Bata Kasari Jogine (in Nepali). Published by NGS, 1996).
- Earthquake Scenario of Kathmandu, Valley. Published by NSET-Nepal, 1998.
- Comprehensive data Base (Basic Information) on Natural Disaster Management Capabilities in Nepal. Report prepared by K.P. Kaphle and M. Nakarmi/ NGS for UNDP/DMS, Kathmandu, Nepal, 1997.
- Badhi Pahiro Binas Bata Kasari Jogine (in Nepali). Published by Luthran World Federation, Kathmandu, Nepal, 2055BS.
- Aaglagiko Binas bata Roktham, PurbaTayari tatha Niyantranka Upayaharu 2054. published by Luthran World Federation, Kathmandu, Nepal, 2054BS.
- **26 Things that help you to survive in an Earthquake (by LWF)**

(a) During an Earthquake:

1. **Stay Calm**
2. **Inside :** Stand in a door way, or crouch under a desk or Table, away from Windows or glass dividers.
3. **3. Outside:** Stand away from buildings, trees, telephone and electric lines.
4. **On the Road:** Drive away from underpasses/ overpasses; stop in safe area; Stay in vehicle.

(b) After an Earthquake:

1. Check for injuries and try your best to provide first aid

2. Check for safety for gas, water , sewage breaks; check for downed electric lines and shorts; turn off appropriate utilities; check for building damage and potential safety problems during after shocks such as cracks around chimney and foundation.
3. Clean up dangerous spills
4. Wear shoes
5. Turn on radio and listen for instructions from public safety agencies.
6. Do not use the telephone except for emergency use.

(c) 13 Survival items to keep on Hand:

1. Portable radio with extra batteries.
2. Flashlight with extra batteries.
3. Fire Aid Kit-including specific medicines needed for members of your household.
4. First Aid book.
5. Fire extinguisher.
6. Adjustable wrench for turning of gas and water.
7. Portable fire escape ladder for homes/ apartments with multiple floors.
8. Bottled water- sufficient for the number of members in your household.
9. Canned and dried foods suf ficient for a week for each member of your household.
10. Non-electric Can opener.
11. Portable stove such as butane or charcoal.
12. Matches.
13. Telephone numbers of police, fire and doctor.

(d) Things you need to know:

1. How to run off gas, water and electricity
2. First Aid.
3. Plan for reuniting your family

(Source: Lutheran World Federation, Nepal- Disaster Preparedness Project, Kathmandu)